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T H E
CARPENTERS COMPANION:

Being an Accurate and Compleat

T R E A T I S E
O F
CARPENTERS WORKS;

In which is contained

Various SORTS of TIMBER-FLOORS,
PARTITIONS, BRIDGES, and especially ROOFS;
with their Manner of *Framing, Trussing, &c.*
made easy to all concerned in BUILDING;
but more particularly to CARPENTERS;

To which is added,

The Five ORDERS, of ARCHITECTURE,
in a more easy and concise Method than any
yet Published.

Exemplified in Forty-One COPPER-PLATES;
With REMARKS and DESCRIPTIONS.

By JAMES SMITH.

L O N D O N:

Printed for J. MILLAN, at the Corner of *Buckingham-Court*, near the *Admiralty-Office*.

M.DCC.XXXIII.

1609/4419.

THE PATENT





T O

GEORGE FOX, Esq;



DEIGN to accept this small Offering at a Time, when ARCHITECTURE is in its Meridian of Glory, and more especially, when so many Volumes have of late been published on this noble ART; some of which have found Sanction under Monarchial Benevolence. This, Sir, is due to You only, not alone for the innumerable Favours heaped upon me thro' Your

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natural

iv *DEDICATION.*

natural Propensity to *Goodness*, but likewise, Sir, as You stand amongst the First, in the Records of Fame, for Your extensive Knowledge of ARCHITECTURE.

AS this is one of the most useful Branches of the Art, and the least taken Notice of, I stand the more in Need of a Patron in appearing, singly, among so many good Judges of it; but, *guarded* by that *Awe* which Your Name alone can fill the censuring Part of Mankind with, I cannot fail of Success.

SIR, as Your just Regard for Truth, Your discerning and unlimited Judgment, Your universal Learning, everywhere acknowledged, joined to that Reverence I owe to Your Person, totally prevent my farther Encomiums
on

DEDICATION.

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on Your more eminently distinguish'd
Faculties ; so Your reserved Modesty
and Aversion to every Thing that has
the Appearance of Flattery, obliges
me, in Silence, only to admire what
Art and Nature has, in You, so glo-
riously performed for the Good of
Mankind, and to beg leave, Sir, to
remain

Your most Dutifull

and Obedient

Humble Servant

JAMES SMITH.



INTRODUCTION.



THE Usefulness of Carpenters-
Work in Building, and the little
 Notice taken of it by Authors
 who have treated of Archi-
 tecture, and the Few there be
 that rightly understand it, prompted me to
 write the following Treatise.

CARPENTERS Work is one of the most
 valuable Branches of Architecture ; it was
 contemporary with the First Ages of the
 World ; with the Knowledge of this Art
Noah closely and firmly connected those
 Timbers together in the Ark, which were so
 nicely Wrought, that they not only kept the
 Water

The INTRODUCTION. vii

Water from penetrating into it, but was Proof against the Tempest and the rolling Billows, when in its Womb, it carried all the Tenants of the Earth and Air.

THOSE Naval Preparations thro' all Ages of the World, as well as those stupendous Temples and Edifices, erected in all Countries, demonstrate the Perfection of this Art. The innumerable *floating Buildings*, which roll from one Country to another, thro' tempestuous Storms, tost from the Mountain's Heighth to the Depths of the Ocean, without injuring the Vessel, evidently shew the vast *Use and Judgment* of Carpenters Works.

BUT as that Branch of it, which relates to *Templar, or Demol, Uses*, is the Subject of this Work, I shall only treat of its Usefulness in them; and I may venture to affirm, that Carpenters Work is the chief Tye and Connection of a Building, it is the Ligaments which bind the Whole together.

THE Band-Timbers which strengthen and tye the Angles of a Building, and prevent
its

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its separating, is the Work of the Carpenter; Lintelling over Doors and Windows, with other Dischargments of Weight, is his Care to perform.

BOND-TIMBER in Cross-Walls, when Settlements happen, if they are well applied, prevent the Cracking of the Walls, for that keeps the Whole together, and every Part setleth a-like, which would fill the BUILDINGS with GAPS and CHASMS if neglected.

NEXT for Floors; the rightly Framing them by Trussing the Girders, by placing them on Joysts, so that they come near no Funnels of Chimneys; the Manner of *Tenanting*, *Tuscing*, framing of Trimmers for Chimneys; Stairs, &c. I say, all these is the Business of the Carpenter to see carefully performed.

PARTITIONS of Timber, their Manner of Trussing to prevent Racking, Settlements, &c. and the Discharge of Weight of *Girders*, *Beams*, or *Cross-Walls*, is Carpenters Work,

as is, likewise, the Framing of Timber-Bridges.

ROOFS of various Sorts, for Common Houses, large Edifices, or Churches, their Manner of Framing, the Height of their Pitch, their Strength, Usefulness, &c. with the various Manner of performing all these Works, is the Subject of this Treatise, which I have rendered intelligible to every Capacity, by Designs of several Sorts, and have described them in such a Manner, that will render the Work useful to Carpenters, in particular, such who are unacquainted with the Manner of Performing these Operations of Framing.

If it should be objected, that there are few Things here treated of, but what every Carpenter knows, I could wish such Objectors, had been at the Pains I have taken to inform the World, since I reap no Advantage by it, but the Satisfaction of communicating any thing which may prove

B

serviceable

x **The INTRODUCTION.**

serviceable to my Country-Men, I therefore
conclude,

Facile est Inventis addere.

and am,

Yours, &c.

JAMES SMITH.



An



TREATISE

O F

CARPENTERS WORKS, &c.



THE first Thing which a Carpenter must consider, for the carrying on a Building, is the Plan, in which you are to prepare your Timber, in having it cut into proper Scantlings, which shall be hereafter noted.

You are to prepare for Lintelling, and Bond-Timbers ; for Lintells over Doors, or Windows, Stuff of five Inches thick, and seven broad, and it is a slight Way of Building to put in any of a less Scantling ; as for Door-Cases, their Manner

of Making, and Scantlings of Stuff, it is needless to speak of; it is the best Way to have them put in when the Foundations are brought up high enough for them. Bond-Timber should be Dove-tailed in the Angles of the Building, and Cross-Walls, as you see in Plate the First, marked 1 and 2, or Angle 3; and here Note, that it is a durable tho' expensive Way, to have all Fir-Timber, which is laid in the Walls of a Building to be pitched, with Pitch and Greefe mixed together; the Quantity of Greefe one Pound to four Pound of Pitch; all these Things are the Care of the Carpenter.

BOND-TIMBERS should be four, or five Inches thick for Cross-Walls, and in the Angles of a Building, six or seven Inches, and proportionably broad, six or eight Feet long, in each Wall, and it would not be amiss to Place them six or eight Feet Distance all the heighth of the Building, in every Angle and Cross-Wall; these, if a Building be on an unfirm Foundation, cause the Whole to settle together, and prevent the Cracks, and Fractures, which happen, if this be neglected.

WE come now to the Floors, in which these Things are to be observed; the Magnitude of the Room; the Manner of Framing, and the Scantlings of the Timber; for the First, you are to observe to lay the Girders always the shortest Way,

Way, and not to have a Joyft, at any Time, exceed twelve Feet in Length.

THE first and common Method of Framing Floors, is, as in Plate the Second Folding, marked A, where the Joyfts are framed flush with the Top of the Girder. The two Cross-Joyfts, mark'd *a* and *b*, are called Trimming-Joyfts; that mark'd *a* is supposed to be against a Chimney; that marked *b* is the Stairs; these Joyfts are always thicker than common Joyfts, being weakened by mortiffing. Scantling of Joyfts, when a Floor is framed in this Manner, ought to be as followeth.

If the Length of Bearing be	Feet	Inches	Inches	Trimming Joyft.
				Length, Scantling Feet Inch Inc.
	5	7	2 $\frac{1}{4}$	
	6	7	2 $\frac{1}{2}$	5 7 & 3
	8	7	2 $\frac{3}{4}$	6 7 & 4
	9	8	3	7 7 & 5
10	8	and Thickness	3 $\frac{1}{4}$	8 8 & 4
11	8		3 $\frac{1}{2}$	9 8 & 5
12	9		4	10 9 & 6

THESE

THESE are such Propositions as will render the Work sufficiently capable of sustaining any common Weight.

THE next Manner of framing Floors, is, as that mark'd B, with binding Joyfts; those six Joyfts mark'd *b*, are called binding Joyfts, fram'd flush with the under Side of the Girder, and about three or four Inches below the Top of the Girder to receive the Bridgings, which are those mark'd *m* in the Floor, and which lye a-crofs the binding Joyfts, and are pinned down to them with Pins of Wood, or Spikes of Iron. These binding Joyfts should be framed about three Foot, or three Foot six Inches, Distance from one another, and their Thickness four or five Inches, or in Proportion to the Length of their Bearing, as Trimming Joyfts.

THESE Floors, if they settle out of a Level with the Building, are made Level, when the Bridgings are put on, which is generally after the Building is covered in, and near compleated; they are generally double tenanted, as you see in Plate the Third, mark'd 1, 2, 3, 4. The common Tenanting is, as 5, 6, 7, 8; that Part of the Floor mark'd D, in the Folding Plate the Second are the same Joyfts, with Ceiling Joyfts tenanted into them, the binding Joyft are chafed, and the Ceiling Joyft, mark'd *n*, are tenanted into them,
and

and put in generally after the Building is up. These Ceiling Joyfts should be about thirteen or fourteen Inches a-part, and the Scantling two and three, or three Inches Square ; and in large Buildings, three and four. As for the Bridgings which lye on the Top of the binding Joyfts, they may be placed twelve or fourteen Inches Distance, their Scantlings three and four, or three and an half and five, their bearing being only from Binding Joyft to Joyft, which is three Feet or three Feet fix Inches, and these are laid even with the Top of the Girder, for to receive the Boarding.

I COME now to speak of Girders, and first for their Scantling. Take these Proportions,

If the Bearing be	Feet	The Girder must be	Inches	Thick	Inches	Deep, and put Edge-ways.
	10		8		10	
	12		8 $\frac{1}{2}$		10	
	14		9		10 $\frac{1}{2}$	
	16		9 $\frac{1}{2}$		10 $\frac{1}{2}$	
	18		10		11	
	20		11		12	
	22		11 $\frac{1}{2}$		13	
	24		12		14	

And

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And here observe, that as every Weight, added to the Weight of the Timber, in the Floor in it self occasions it to settle, the Girder should be cut Camber; if a ten Feet Bearing, half an Inch Camber; if twenty Feet Bearing, an Inch Camber, &c. in Proportion to the Length of the Bearing.

AND further, to strengthen the Girder, and to prevent its Sagging, as it is called among Workmen, that is, its Binding downward: I have in Plate the Fourth, &c. given you several Ways of Trussing Girders, which have been, most of them, practised. There are two Sorts in Plate the Fifth, mark'd 3, 4, that I never saw any where perform'd.

THE Manner of Trussing these Girders, is first, to saw the Girder down the Middle, the deepest Way; then take two Pieces of dry Oak, about four and a half or five Inches wide, and four Inches thick; let half the Piece be let into one Side of the Girder, and half into the other, as you see in Plate the Fourth, *Fig. 1*, mark'd *a a*, which are the two Trusses; *Fig. 2*. is another Way, which is by cutting the Girder thro', and driving a Wedge against the Ends of the Trusses, as the Wedge *d*. When these are thus prepared, bolt them together with Iron Bolts and Keys, or much rather a Screw at the End of the Bolt. *Fig. 3* and *4*, are other Ways of Trussing.

SOME

SOME Carpenters cut their Girders down the Middle, and bolt them together, without Trussing, only changing the Ends different from what they Grew, whereby the Grain of the Wood is crossed, and it becomes much stronger than if it had continued without sawing down the Middle, and thus putting it together.

SOME in Trussing of Girders, make use of other Trusses, as in Plate the Fourth, *Fig. 4*; Plate the Fifth, *Fig. 1*, with Butment, as *Fig. 2*, mark'd B. In Plate the Fifth you see those two Trusses, I spoke of, mark'd 3, 4, of my Invention with one invented Arch; I propose that to be of Iron, mark'd A, which is let into the Trusses. The upper arched one I take to be of great Strength tho' the Trusses are inverted; for the Pressure being upon an Arch, whose Buttment is good, I think, a great Weight can no Way occasion the Bending the Girder. *Fig. 5*. is a Girder cut Camber, but not trussed.

THE Girder being thus trussed and put together, proceed in framing the Joyst, as in common Floors. The strongest Way being double Tenanting and Tuscing, as is before shewn in the Binding Joyfts, Plate the Third. Before I leave this Part of Floors, I shall observe to you, that the best, and most Workman-like Manner of framing Floors, is to plain all the Upper-Edges

of your Joysts streight; for the streighter and truer your Joysts lay, the truer your Boarding will lay, which is a great Ornament to a magnificent Room; but if you frame without Binding Joysts, and lay on Bridgings; Plain the Bridgings, and lay them very Streight and Level; this Care taken will save a great deal of Trouble in laying down the Boarding, which you are often forced to chip and furr up, to make them lay even; and, those Furrings are not only Troublesome, but are apt to give Way, and occasion the Creeking of the Boards as you walk on them; it would be a good Way to turn Arches of Brick over the Ends of the Girders of the Floors, because, if any Alteration happens they are easily taken out.

I COME now to Partitions of Timber, with their Manner of Framing. Timber Partitions have these Properties attending them. They take up less Room, and are cheaper than those of Brick. Suppose the Partition, Plate the Sixth, &c. to be of Brick-Work, twenty-three Feet long, and twelve Feet high, one Brick and a half thick; there is one Rod of Brick-Work in it, which, at the lowest Price, may be reckoned five Pounds fifteen Shillings; and if it be done with Timber, six Inches thick, in the Manner here shewn us, may be done for one Pound sixteen Shillings *per* Square; in it is two Square and three Fourths of Partition, which makes but four Pounds nine Shillings, and the Difference

Difference one Pound six Shillings cheaper, and takes up less Room in Thickness.

We suppose this Partition to be in a Warehouse, or some Place where Girders, or some Weight, is to lye on those King-Posts mark'd A A, &c.

In Plate the Seventh, This Partition is proposed to rise two Stories; one thirteen Feet, the other twelve on one Side, and a Ground Room, such as a Hall or Salloon, on the other Side, to go the whole height of the two Stories, mark'd A B. The Joyst mark'd F, of the Story, are to lay upon Enter-tyes, mark'd D, and the King Post in the Middle, mark'd E, is to bear a Girder, or Beam of the Roof, if required,

Plate the Eighth, is a Partition differently framed from the two foregoing, and may be applied to various Uses. As to the Manner of Framing them, the Plates themselves so easily express, that I have need to say no more on that Head, but proceed from Floors to Roofs, on which I shall make necessary Remarks, as they occur in their Places,

As to Roofs, there is a Plate to go round a Building which may, or may not, be deemed a Part of the Roof; it may be deemed the Foundation and Tye of the Roof and Walls; or it may be

as only, that on which the Roof lyeth. These Plates are to be dove-tailed at the Angles, and tenanted together, in their Length, several Ways, as may be seen in Plate the First, *Fig. 3*, and Plate the Third, mark'd A, B, C, D, the Beams of the Roof, which serve as Girders to the Ceiling Floors (and into which the principal Rafters of the Roof are tenanted) are dove-tailed, or what by Workmen is termed cogg'd down, to the Plate which prevent its flying out from the Foot of the Rafter whose Buttment is against it; and in the Angles of a Building, Pieces dove-tailed cross the Angles of the Plate, serve to keep it from spreading, and is the Foot of the Hip, as you see in Plate the First, mark'd 4.

THERE are various Sorts of Roofs, and various Ways of Framing them, and different Heights, for Buildings of the same breadth, according to the different Sentiments of Surveyors, or Carpenters; and as a good Roof is the most difficult, and most useful Part of Carpenters Work. I have, therefore, given so many different Designs for the Workman to chuse which he shall think the most proper to make use of. The common Pitch of Roofs is to have the Rafters Length, if it span the Building at once, to be three Fourths of the breadth of the Building. Some make them flatter as a Pediment Pitch, and the old Gothick Way was to make them the whole Breadth: I have partly, in my first Designs, taken a Middle Path
between

between both Extreame of three Fourths of the breadth of the Building and Pediment Pitch, making the Pitch, or Perpendicular Heighth, to be two Sevenths of the Breadth of the Building within Side, as you may see in Plate the Ninth, and the Length of the Rafter four Sevenths; *a* being of the Breadth of the Building, or twice the Perpendicular Heighth of the King-Post; *Palladio* says, “ the Breadth of the Place to be roofed
“ must be divided into nine Parts, two whereof
“ shall be the Pitch; for, says he, if the Roof
“ were made one Fourth of the Breadth, it would
“ be too steep.”

BUT you are to observe, that *Palladio* speaks of *Italy*, or those Southern, or more warmer Climates, for he says, “ in *Germany*, where the Snow
“ falls in great Quantities, the Roofs are made
“ very sharp, and are covered with Shingles, &c.
“ for otherwise the Weight of the Snow would
“ crush them.” The Weight of the Pitch of a Pediment is one Fourth of the Breadth of a Building, which is esteemed, in *England*, rather too flat, especially for Tyling; therefore, I have avoided to make use, either of that Proportion, or of one Third of the Breadth of the common Pitch, and have made a Medium Proportion between the two Extreame, &c.

Example

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Example. Suppose a Building be ten Feet broad,
take the following Table.

If the Breadth of the Building be	Feet	Feet Inc.	Feet Inc.	Feet Inc.
	10	2 6	3 4	2 10 $\frac{1}{4}$
	12	3 0	4 0	3 6
	14	3 6	4 8	4 0
	16	4 0	5 4	4 6 $\frac{1}{2}$
	18	4 6	6 0	5 2
	20	5 0	6 8	5 8 $\frac{1}{2}$
	22	5 6	7 4	6 3 $\frac{1}{2}$
	24	6 0	8 0	6 10 $\frac{1}{4}$
	26	6 6	8 8	7 5
	28	7 0	9 4	8 0
	30	7 6	10 0	8 7
	32	8 0	10 8	9 2
	34	8 6	11 4	9 8 $\frac{1}{2}$
	36	9 0	12 0	10 4
	38	9 6	12 8	10 10 $\frac{1}{2}$
	40	10 0	13 4	11 5

THE

THE Use of the Table, if the Span, or Breadth, of the Building is twenty-four Feet the Perpendicular Height of a Roof, Pediment Pitch is six Feet; if the common Pitch eight Feet, the Medium of which I have made six Feet ten Inches one Fourth, for the following Reasons.

THE common Pitch is not only unpleasing to the Eye, but is attended with this inconvenience, if there is a Gutter round the Building, the Steepness of the Roof occasions Rain to come with so sudden a velocity into the Pipes, which are to convey the Water from the Gutters, that they fill the Gutter; and sometimes so fast, that the Water runneth under the Covering of the Roof, and do great Injury to the Timber, &c. of the Building, and the steeper the Roof is, the longer the Rafters, and the greater Quantity of Timber must be used in the Roof, as well as the more Weight from the greater Quantity of Timber, and the weakening the principal Timbers, by adding more to its own Weight.

AND the Pediment Pitch is inconvenient in lying too flat for these Climates so frequently subject to Rain, and heavy Snows, which last would vastly press and incommode a Building, and would lye much longer on the Roof; its Declivity being so small, besides, in keen Winds, attended with Rain, the Rain would drive under the Covering

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vering of Slate or Tyles, &c. and create much decay in the Timber.

To avoid both these Ill-conveniencies, I have made Use of a Middle-Path between these two Extreame, in, the nine or ten following Designs, Plate the Tenth, Eleventh, Twelfth, Thirteenth, &c. and have varied them, by making them stronger some more than others; that the Method may be made use of, as Necessity requireth, and Time allowed to perform it in. Proportions of Beams, whose Bearing varieth, take the following Rule.

If the Beam bear, in the Clear,	Feet	The Scantling must be	Inch	&	Inch.
	12		6		8
	16		6 $\frac{1}{4}$		8 $\frac{1}{2}$
	20		6 $\frac{1}{2}$		9
	24		7		9 $\frac{1}{2}$
	28		7 $\frac{1}{2}$		9 $\frac{1}{2}$
	32		8		10
	36		8 $\frac{1}{2}$		10 $\frac{1}{2}$
	40		8 $\frac{1}{2}$		11
	44		9		12

PRIN-

PRINCIPAL Rafters should be near as thick at the Bottom as the Beam, and should diminish in its length one Fifth or one Sixth of its breadth, the King-Posts should be as thick as the Top of the principal Rafter, and the Breadth according to the Bigness of the Strutts you intend to let into them, the middle Part being left something broader than the Thickness.

STRUTTS may diminish as the Rafters do ; one Fifth, or one Sixth of their Length. In placing Strutts and Collar-Beams, the dividing the Rafter into as many equal Parts as you propose, Bearings is the Rule, because every Part of the Principal will have equal distant Bearings.

PURLINS are the same Thickness as the principal Rafters, and the Proportion of the Breadth, is six to eight, that is, if the Rafter be six Inches thick, let the Purlines be six Inches thick and eight broad ; if it be nine Inches thick, the Breadth of the Purlin is twelve Inches broad, &c. *N.B.* The Purlins are those Pieces into which the small Rafters are tenanted, and they are tenanted into the principal Rafters, see Plate Twenty-eight, mark'd A A, &c. Length of Purlins are generally from six Feet to eleven Feet, not exceeding that Length. Small Rafters, their Scantling two Inches and half and four Inches, three Inches and four Inches and half, and three Inches and half, and five Inches, according

D

to

to the Magnitude of the Roof, and the Length of the Rafters. Small Rafters should not exceed seven Feet in Length in a purlined Roof; if it happen, that the Length of the Principal be above fifteen Feet, it is best to put in two Peer of Pur-lins in the Length of the Rafter, as you see Plate twenty-eight, &c.

IN Plates the 14th, 15th, and 16th, are three different Designs for Roofs, in which are proposed to be Rooms, as A A, B B, and C C, one of the same Roofs to have a Vally in it, as 14th, to contract the Length of the Principles, and framed with a Collar-Beam, and Middle Post, which if possible, were better to have a Wall or Partition under it, and each of the middle Posts, of the other two Roofs following, which I have made much stronger in the Manner of Framing.

Plate seventeenth is a Roof designed for the Span of a large Room, such as Halls, Salloon, or publick Entertainments, to be coved in the upper Part as Plate eighteen, either elliptically as A, or the Segment of a Circle, as B. The Use of Coving a Room of a considerable Heighth is first, the making it much lighter than it would otherwise be, if Level in the Ceiling the Rays of Light in a Cove, are reflected back again into the Room, which would be otherwise lost and confused in a Room with a flat Ceiling; the two Beams, mark'd *a a*, are let into each other, and pinned, as at *b b*.

LIKE-

LIKEWISE all Rooms with circular Roofs or Ceilings, are more commodious, and useful for Entertainment for Musick, &c. The Angles of Incidence are always equal to those of Reflection; so the Undulation of Sounds flying on any Cove, or spherical Part of a Building, reverberate on the Audience; and if spherical no Part of the Sphere can receive the Vibration, but it will return in the same Angle from whence the Undulation first began. The reflecting Rays of Light, and and Reverberation of Sounds proceed from the same Cause; and from Incidents naturally affecting the Eye and Ear.

THE ROOFS framed after the Manner of the following Plates 19, 20, 21, 22, &c. are very strong, well-connected together, and sufficient to bear a Covering of Lead, &c. or any other Material. These Roofs are design'd chiefly for large Rooms to be coved, Elliptically as A, or a Segment, as B. Plate eighteen, the Pitch is near the Gothick Manner, tho' I have not seen any so well executed; the Roofs of the Gothick Buildings are generally the Length of the Rafters, the whole Breadth of the Building, which is very Acute, and Plate 23 and 24, are Designs of Church Roofs. The First is mark'd A, to have a Cove over each Gallery, mark'd B of a Semicircle, and the Middle Part dressed with such Ornaments as shall be thought necessary in the Dis-

position of the Ceiling; the other is proposed as a flat Ceiling over the Galleries mark'd C, and covered in the middle Part mark'd D, E, and F; is the Ornament over the Column. Here it is to be observed, the principal Posts stand on an Entablature, of a Column as mark'd G, the dotted Lines representing the Cove; these Roofs are very flat and strong, being proposed to be covered with Lead.

PLATE 25 and 26, are two Roofs of a more acute Pitch, after the Gothick Manner, and of a prodigious Strength, the Bearing equal, as 1, 2, 3, 4. The Principles are mortised to receive the King-Post which is tenanted into them at the Top. These Roofs have a Kind of Demy King Posts, which might be strapp'd up with Iron in the Middle, and the Principal to the Beams, as you see in many of the preceeding Roofs.

HAVING thus passed through the Description of Roofs. I now propose to lay down Rules to find the Length and Back of the Hip, as is delineated in Plate 27.

SUPPOSE A, B, C, the Roof given *Fig. 1.* a true Pitch. Take the Length of the Rafter A and B, or B, C, and set one Point of your supposed Rafter upon the Beam, at the Point D, which is a perpendicular Line, supposed to be continued above the King-Post, to the Point E, from the Point E draw

draw a Line to C, or to A, and that is the Length of the Hip required.

Fig. 2. In the same Plate, I have shewn another Way of finding the Length of the Hip, either above or under the Pitch, which take as follows. Suppose A, B, C, the Pitch of the Roof given continue the Back of the Rafter, as is explained by the dotted Line, either to E, or F, then take the Height of the Perpendicular from D, to B. Set one Point on B, and extend the Perpendicular to E or F, from those two Points E and F, draw the Hip, E and C, or F and A, which is the Length of the Hip.

In the same Plate, I have shewn, by dotted Lines, how to find the Back of the Hip; take the Height of the Perpendicular Line D, B, and make the Parralelogram A, G, H, C, the Perpendicular Line D, B, making it a double Square; then draw the two Diagonals, D, H and D, G; cutting the Rafters I and K, then set the Compasses on Points I and K, and describe the Arch-Line on the Hip L and M; from the Points L and M set the same Length to the Points N and O, the Center of the Rafters I and K; then draw the dotted Line o D and o H, and D, N, and N g, gives you the Back of the Hip.

HAVING thus found out the Back of the Hip, &c. In the following Plate 28, I have laid down a Plan of a Roof with its Manner of putting together

ther. The Side A has only one Tire of Purlins, and two Length of Rafters as has likewise the End. The Side B, and End D, has two Tire of Purlins and three of small Rafters, to diversify the Manner of Framing them. I have explained as far as is necessary all Things relating to framing of Floors, Partitions and Roofs of Buildings, and Churches. I shall only make Use of some Remarks relating to the Framing of Bridges, as I find it essentially dependant on Carpenters Works.

BRIDGES, the better and safer passing of Rivers, &c. are most durable, if made with Bricks or Stone, of Bricks are many, especially in *Italy*, one of one hundred and eighty Feet, span in one Arch, and rises eighty-four Feet, standing between two Mountains, under which Bridge is a large navigable River; Bridges of Stone, are likewise numerous, as that of *London*, and the Great-Arch at *Blenheim*. Of Bridges of Wood are various Numbers, over the River of *Thames*, as *Putney*, *Kingston*, *Chertsey*, *Stains*, *Doebet*, *Maidenhead*, *Reading*, &c. and Rivers of less Breadth innumerable. Those of the Bridges, Plate 29, are very strong, and the Buttment against Stone-Piers, the dotted Line represents the highest flowing of the Water, mark'd A. Next Plate 30 is the Plan or Manner of framing of the Floor, on which is laid the Planks for Boarding and laying on the Earth or paving, it is braced each Way, and tenanted in the Posts mark'd A, B, C, D, E, Plate 29 and 33 strapp'd up with

the cross Beams. In Plate 31 is another strong Method of framing the Floor and Buttments as the former. Plate 32 is the profile of Framing Perpendicular Posts, upon an Arch-Line of Timber, and the last Plate 33 represents the same Manner of Framing the Posts tending to the Center, which forms the Arch of the Bridge, the Posts being mortised to receive the Floor, and strapped at A, B, C, D, E, F. These two last Examples are by much the most preferable Way for Strength. As the Buttments are good no Pressure can make the Going of the Bridge settle, which is not so easily defended in the foregoing Examples.

I have nothing more to add, but my Wishes, that this may prove as useful as I intend it; that is to instruct others: sufficiently pleased in this, that if my Wishes do not succeed, I shall rest satisfied with this secret Pleasure of having endeavoured well, and not misapplied my Time, since it has been spent in an agreeable and innocent Amusement.

F I N I S.

E R R A T A.

Page 8. line 14. *for on read or*; p. 14 l. 1. *for Propositions read Proportions*; p. 16. l. 9. *for Binding read Bending*; p. 17. l. 13. *for invented read inverted*; p. 21. l. 20. *for weight r. height.*

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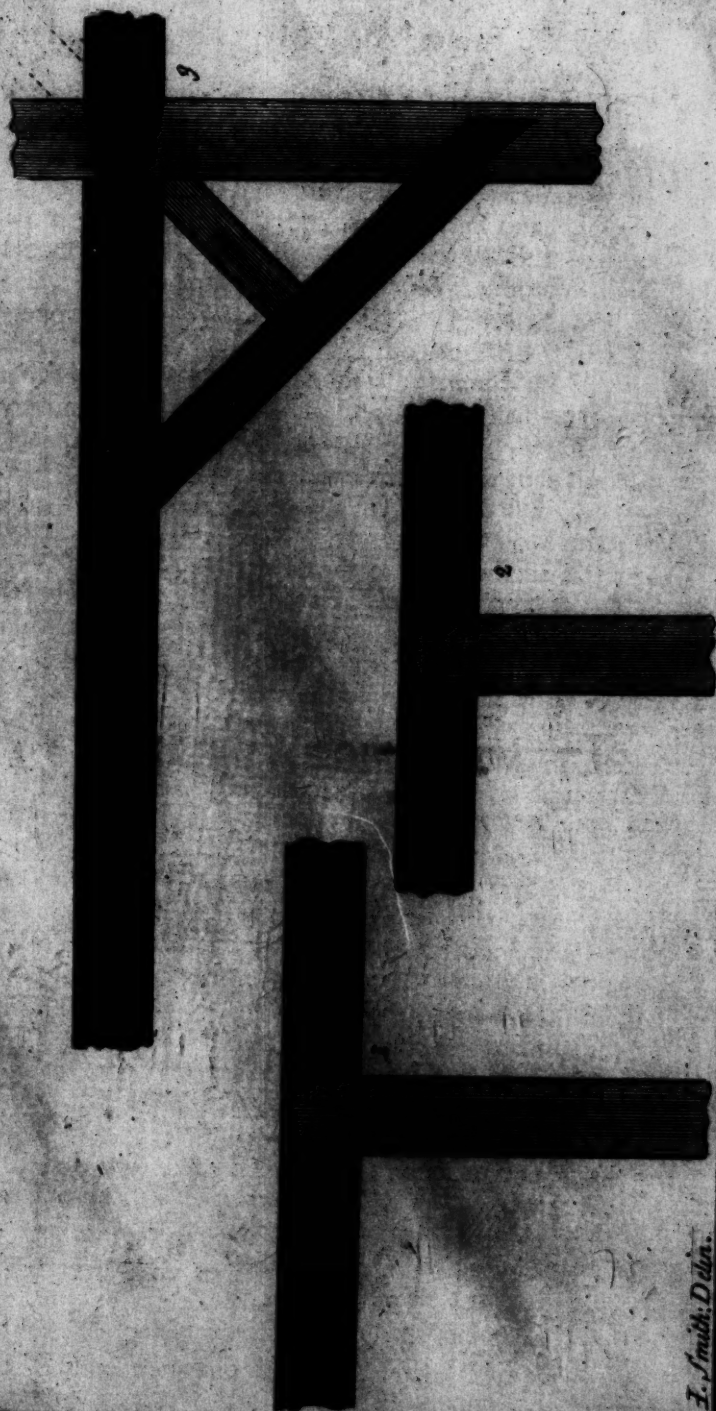
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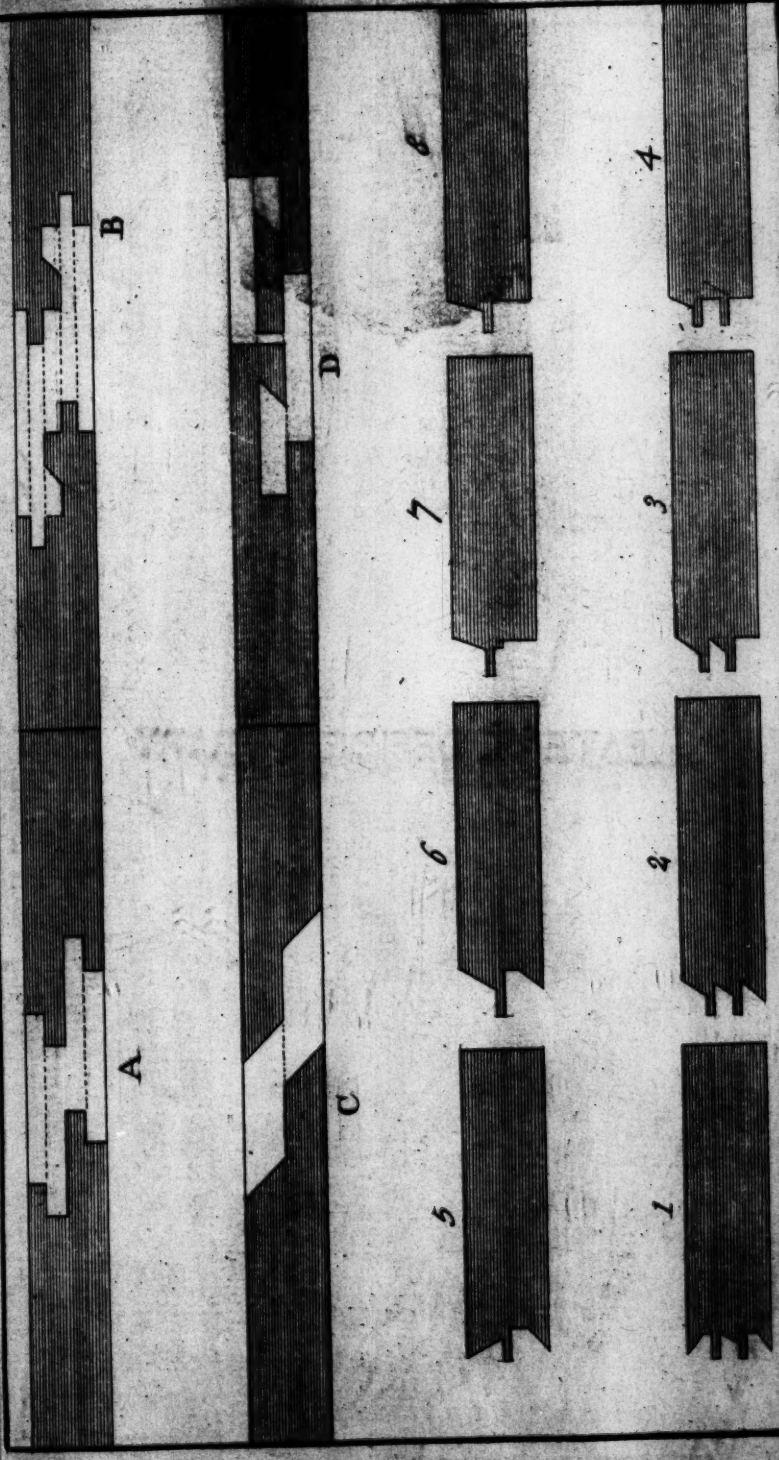
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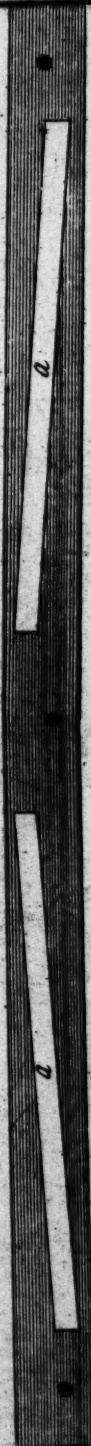
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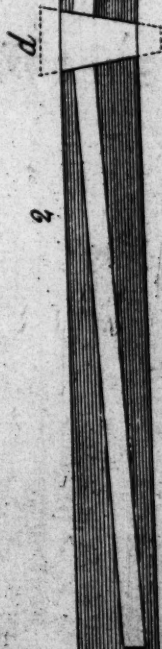
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Plate 4

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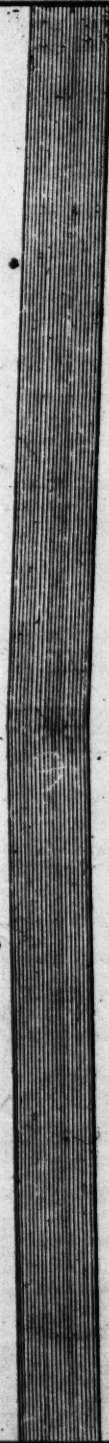
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Plate 5

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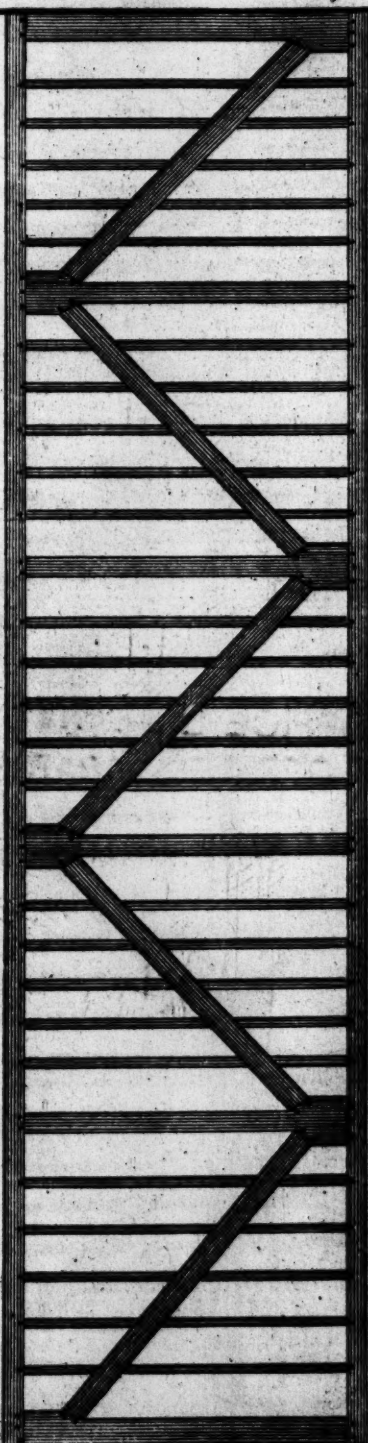
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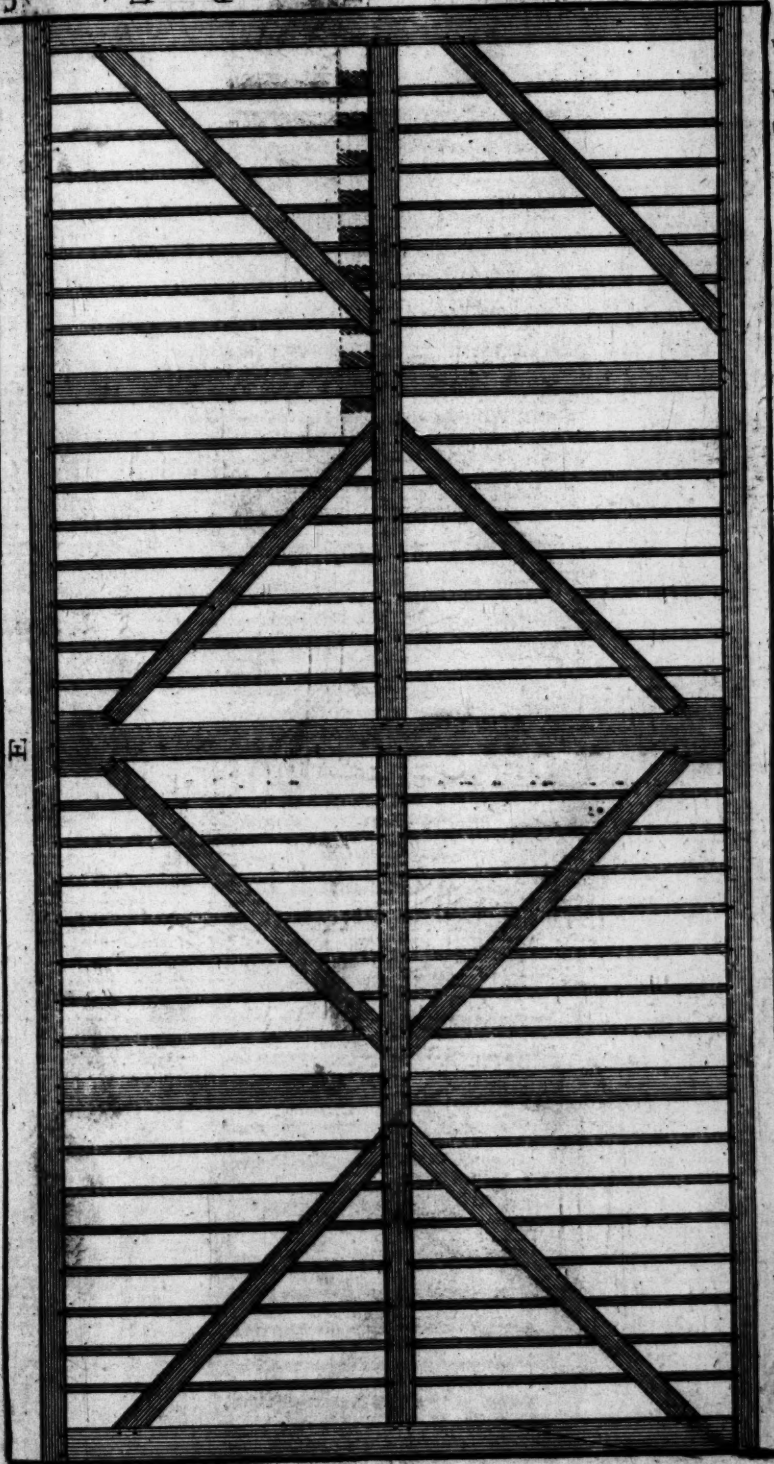
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A 19 Feet
B 12 Feet

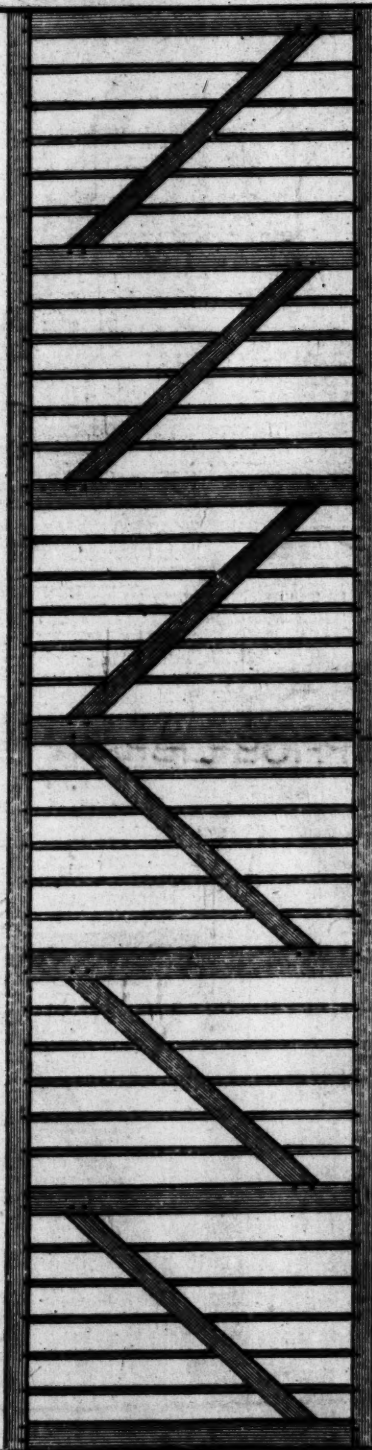
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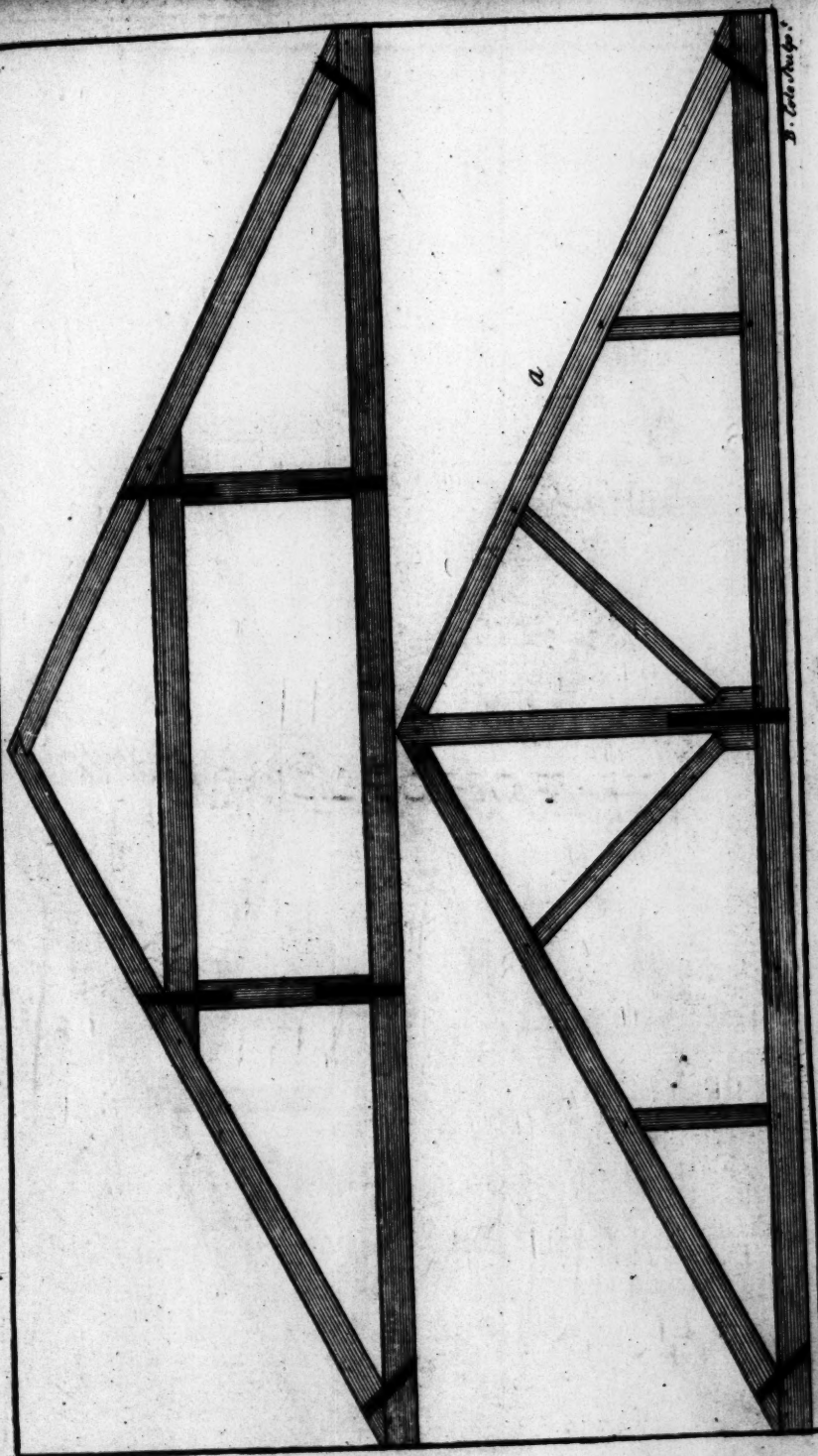
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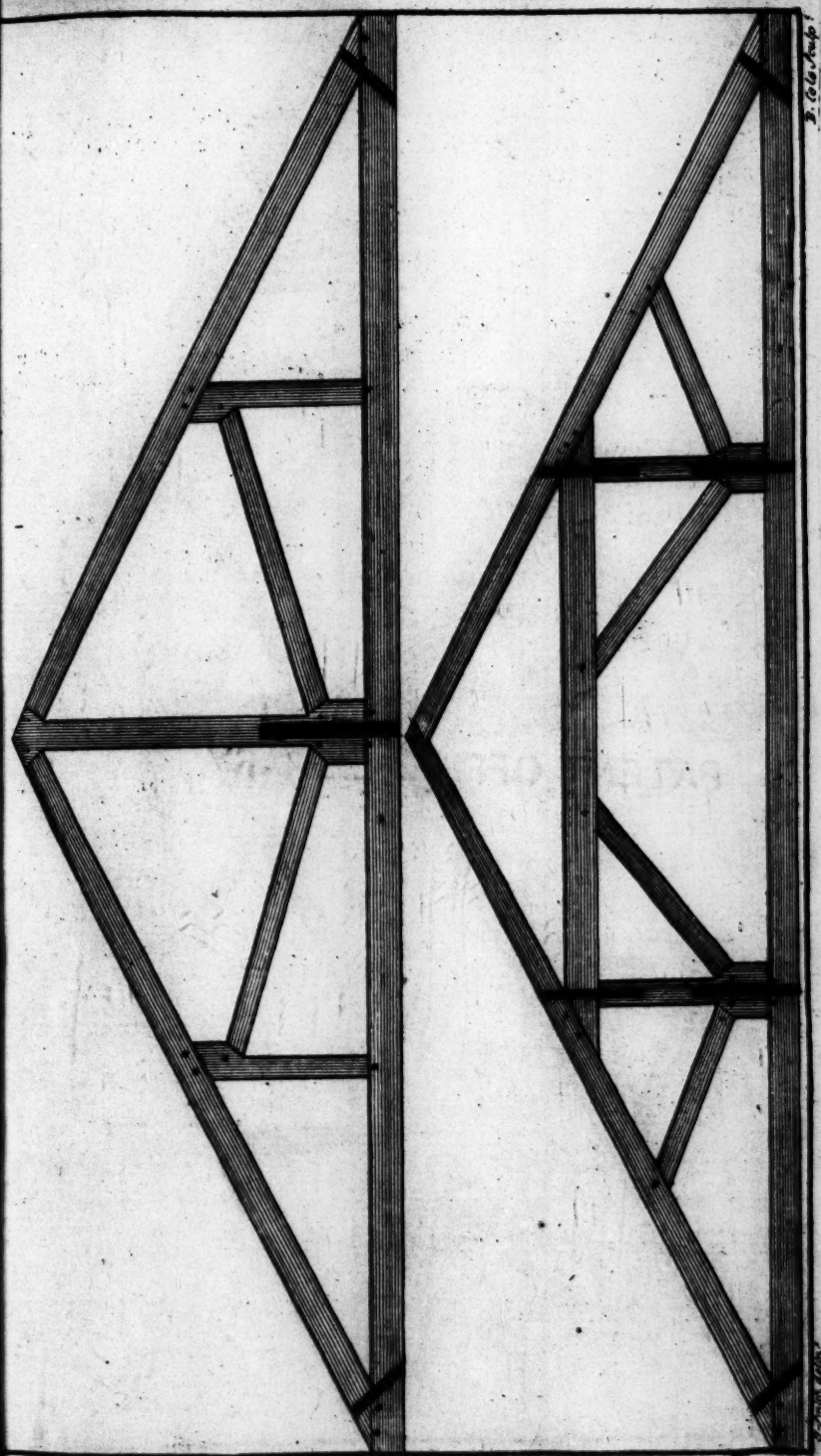
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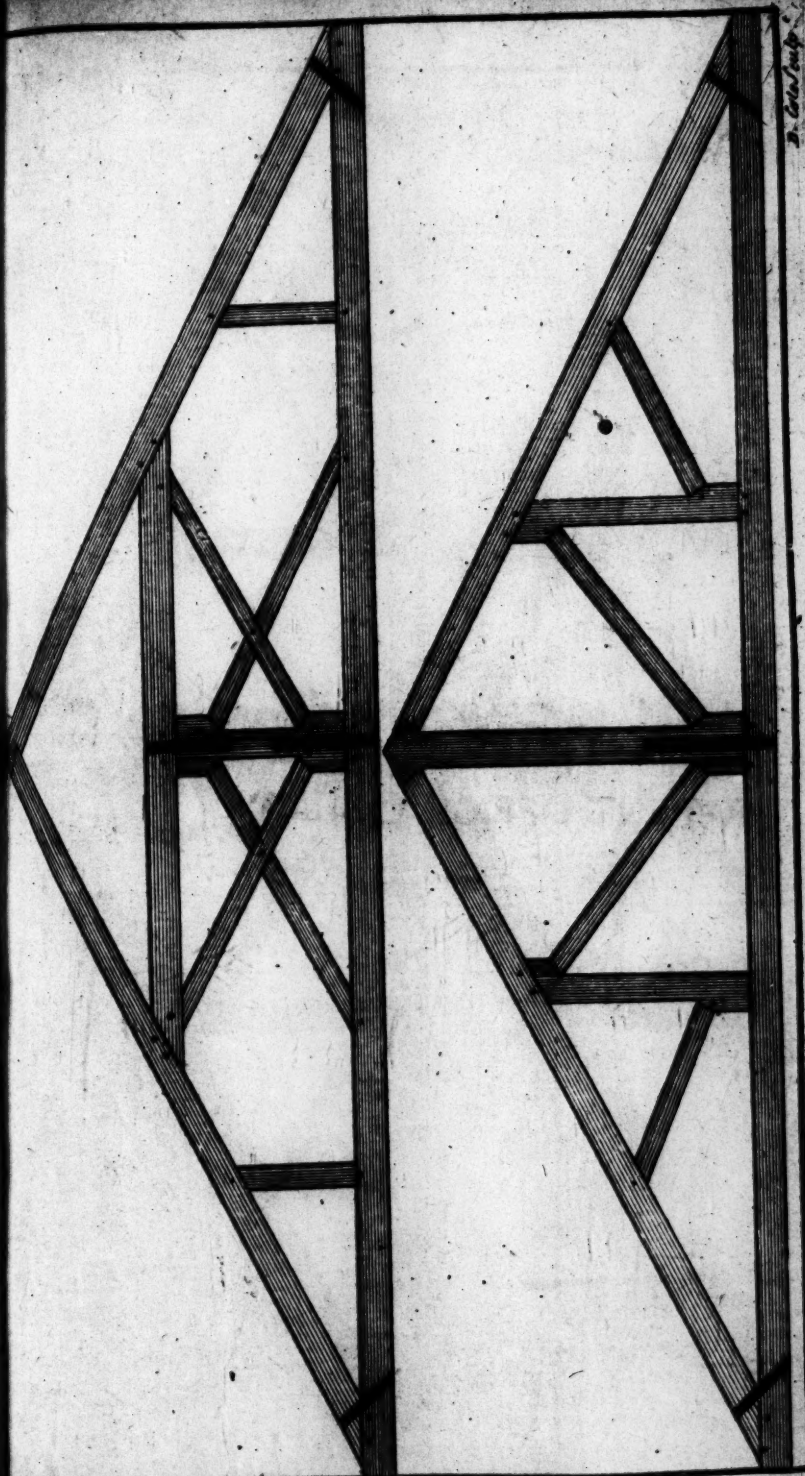
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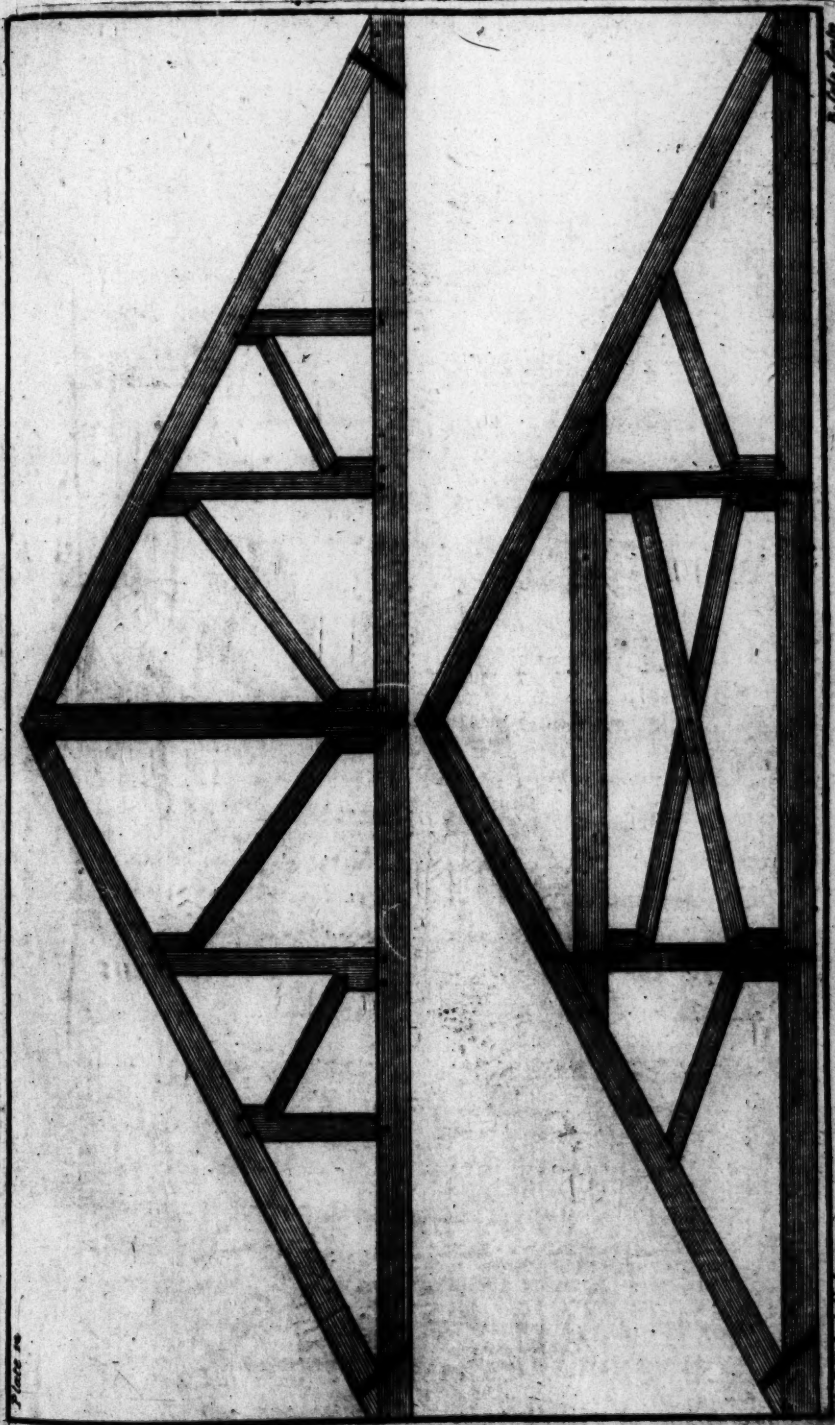


Table Ship

Table Ship

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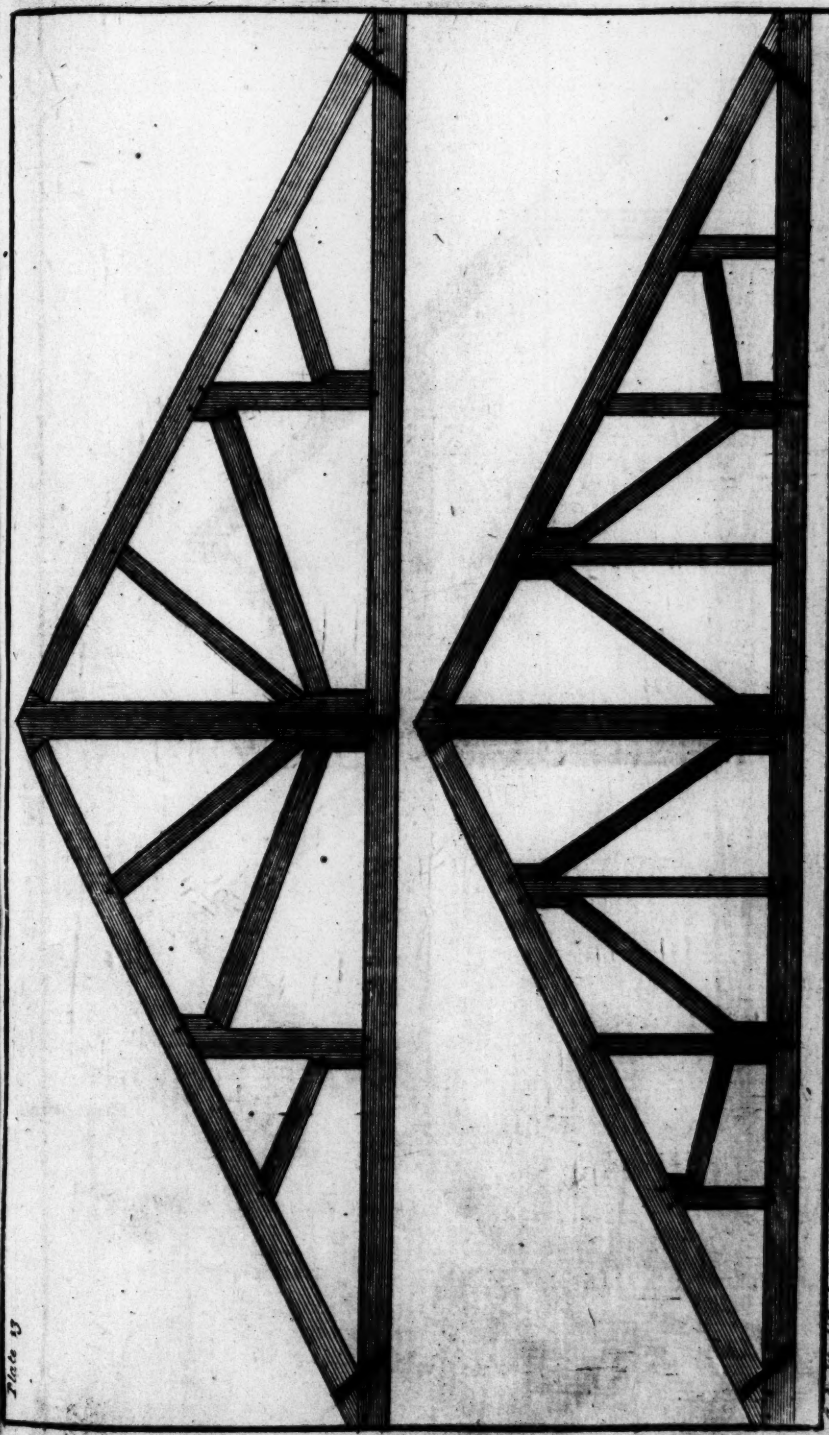
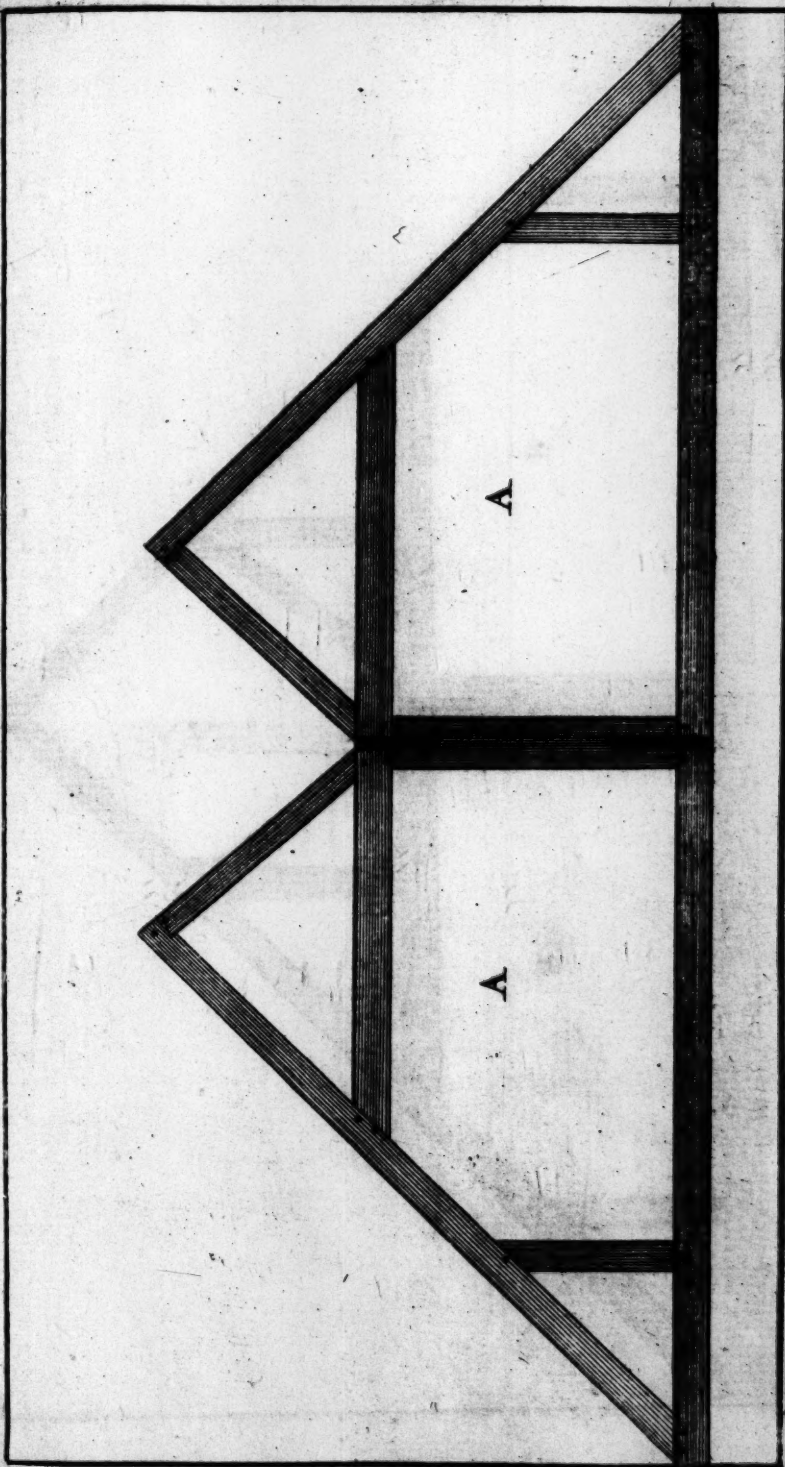


Plate 17

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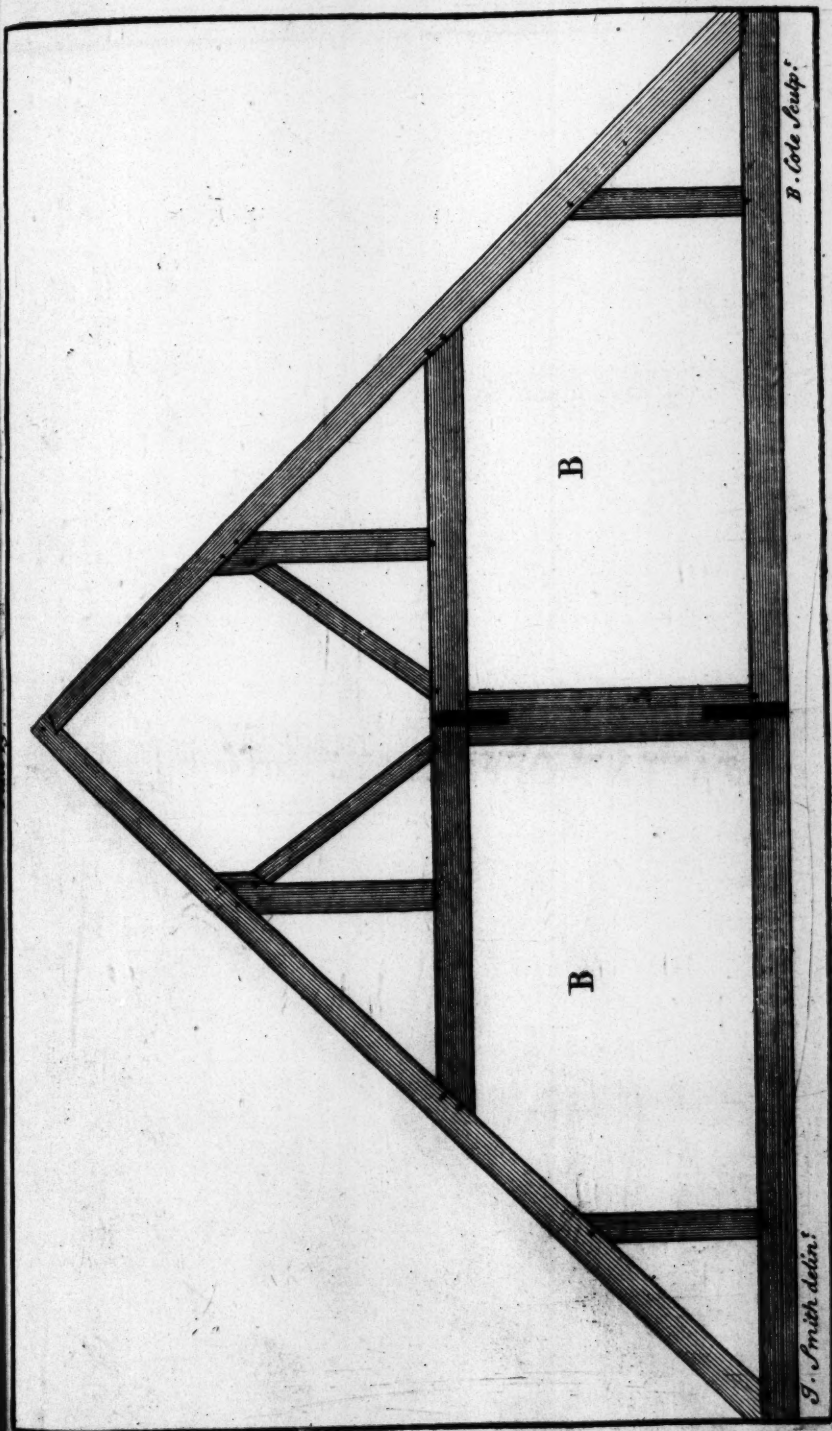
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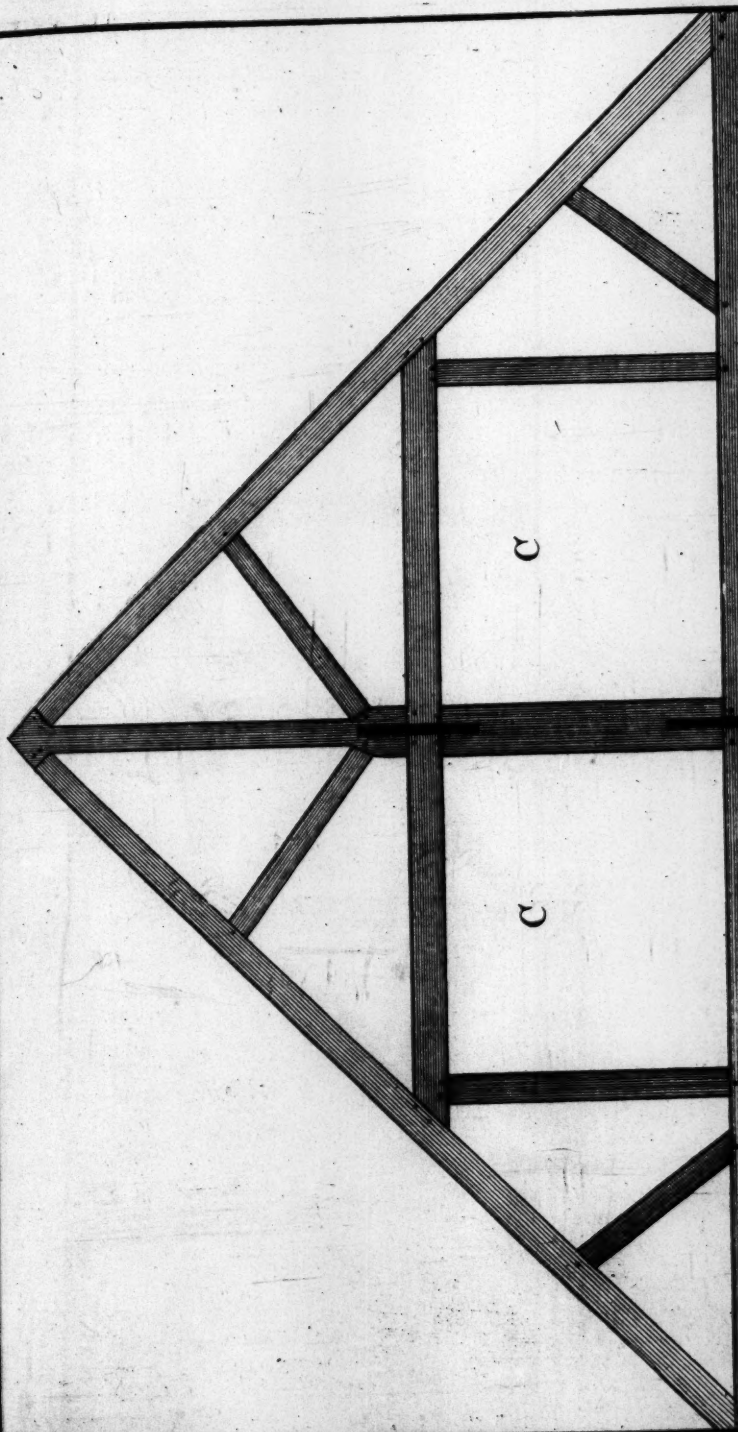
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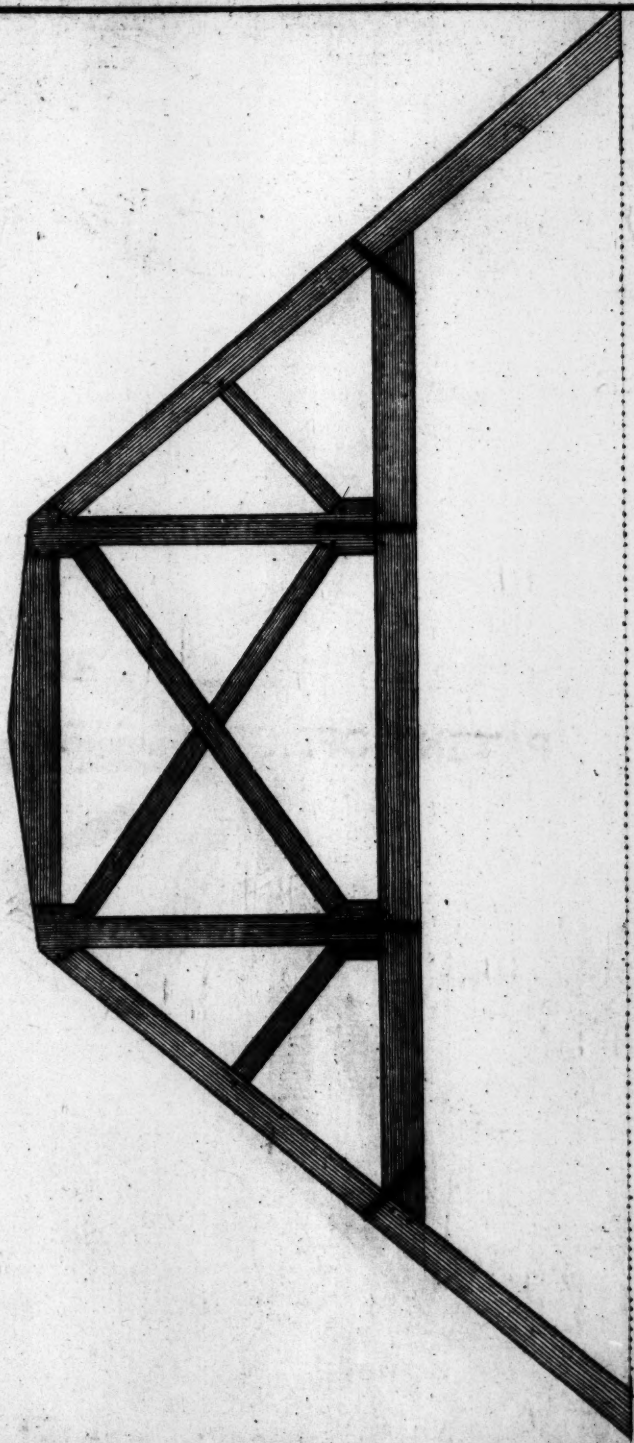


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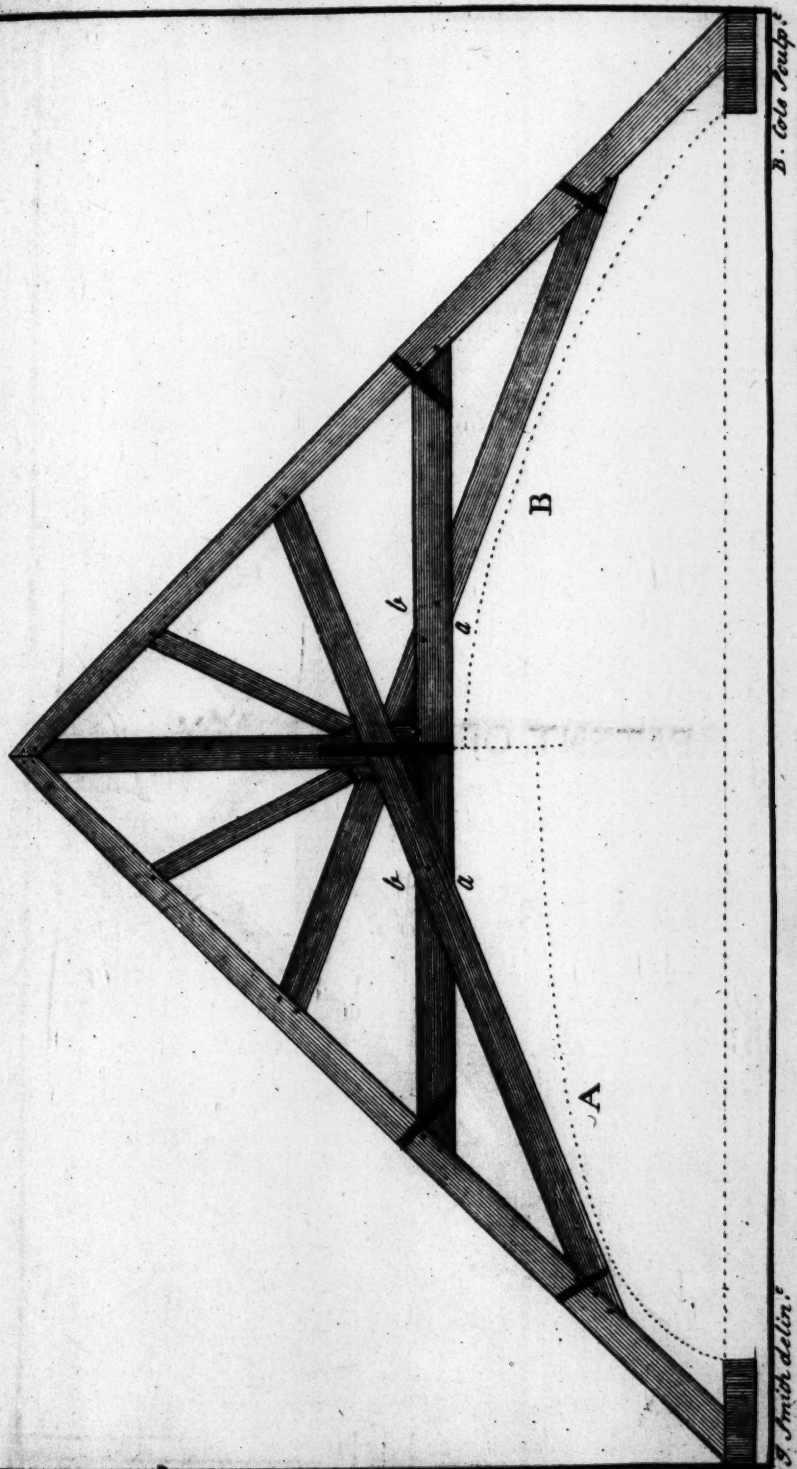
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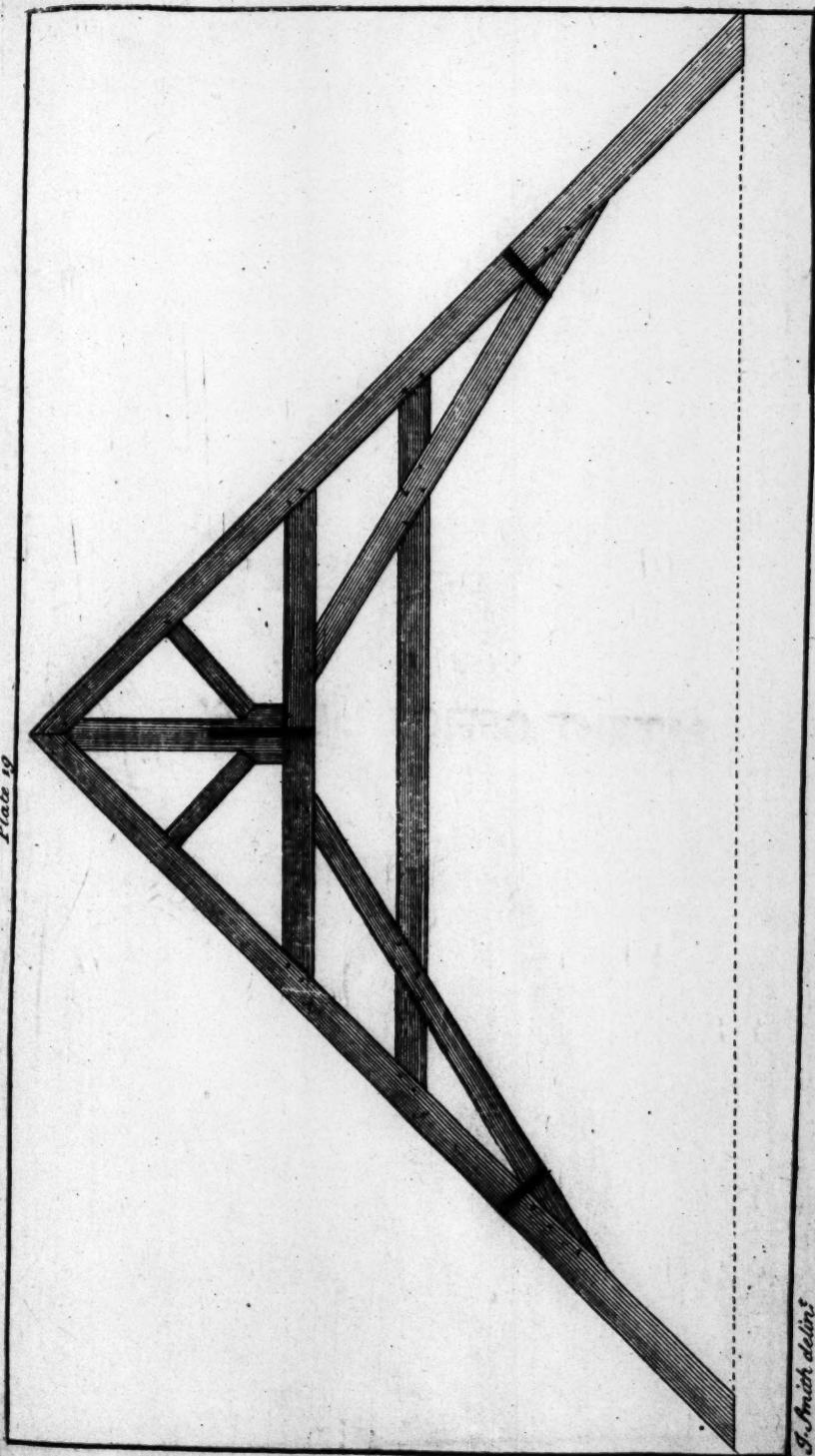
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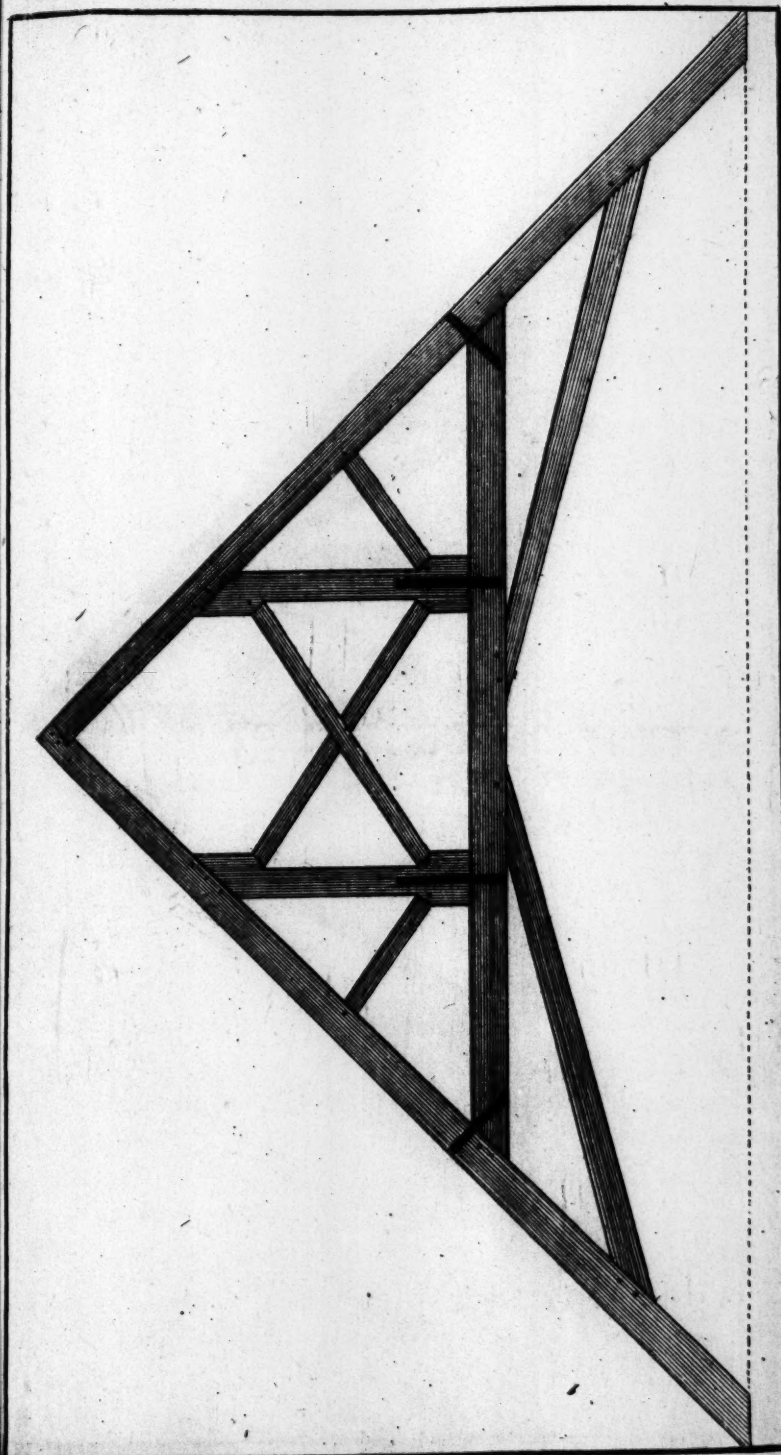
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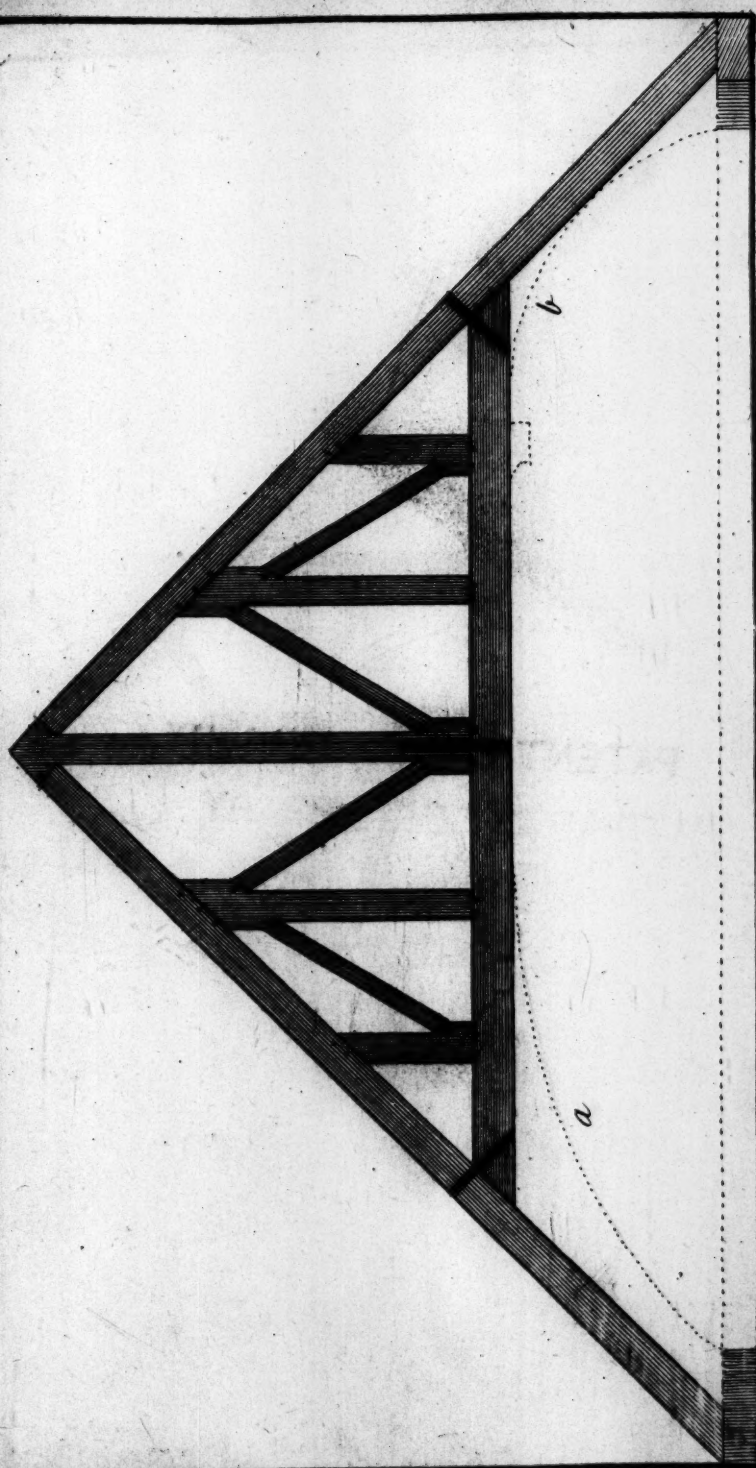
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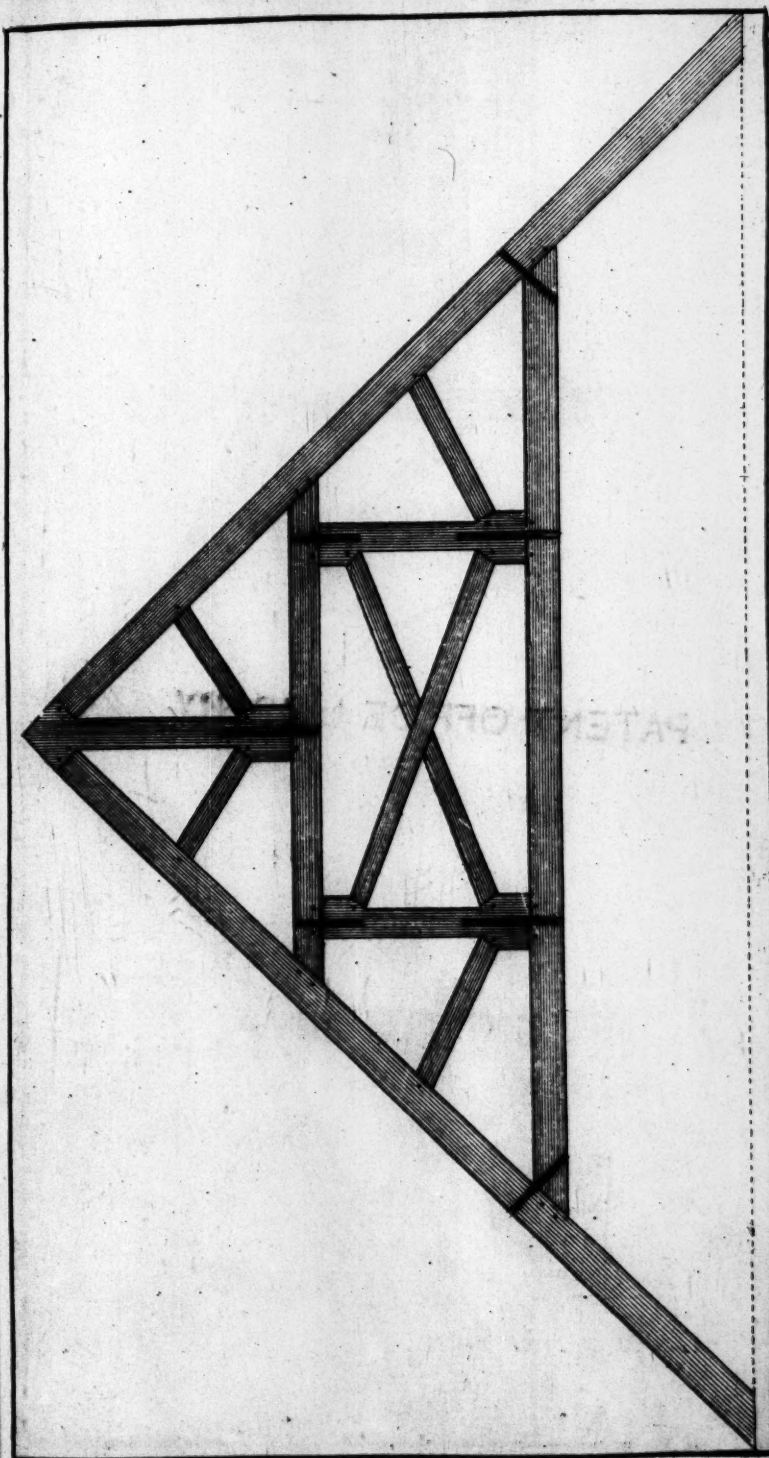
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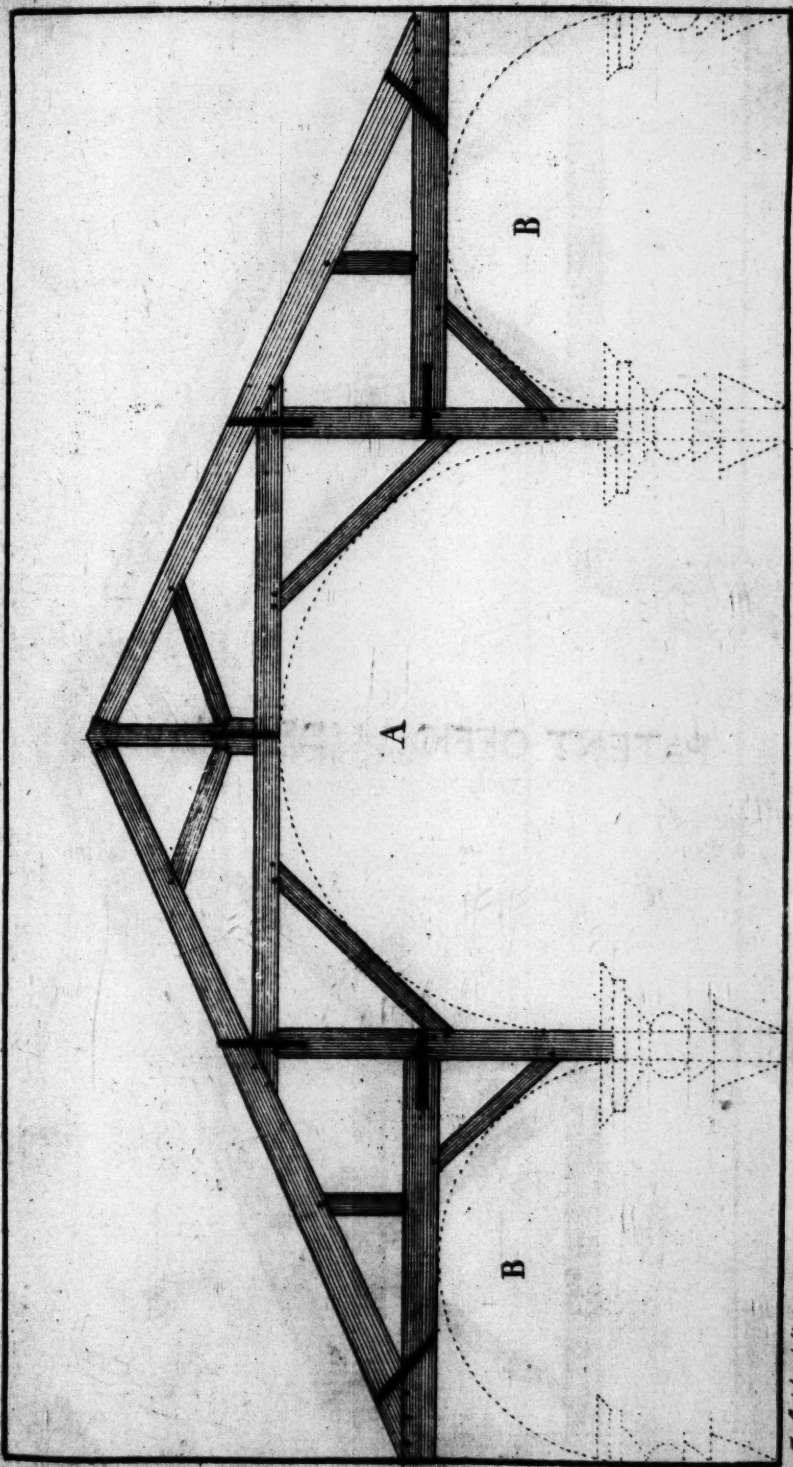
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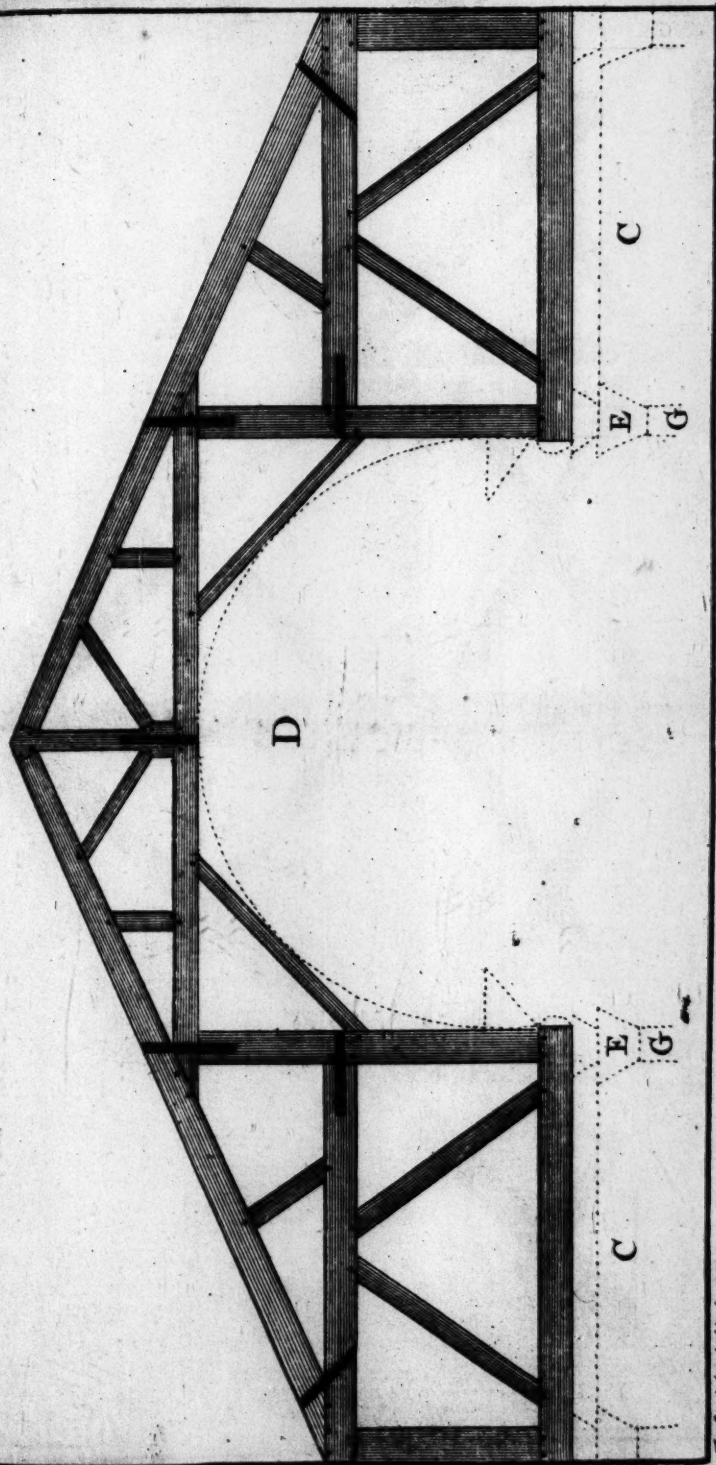
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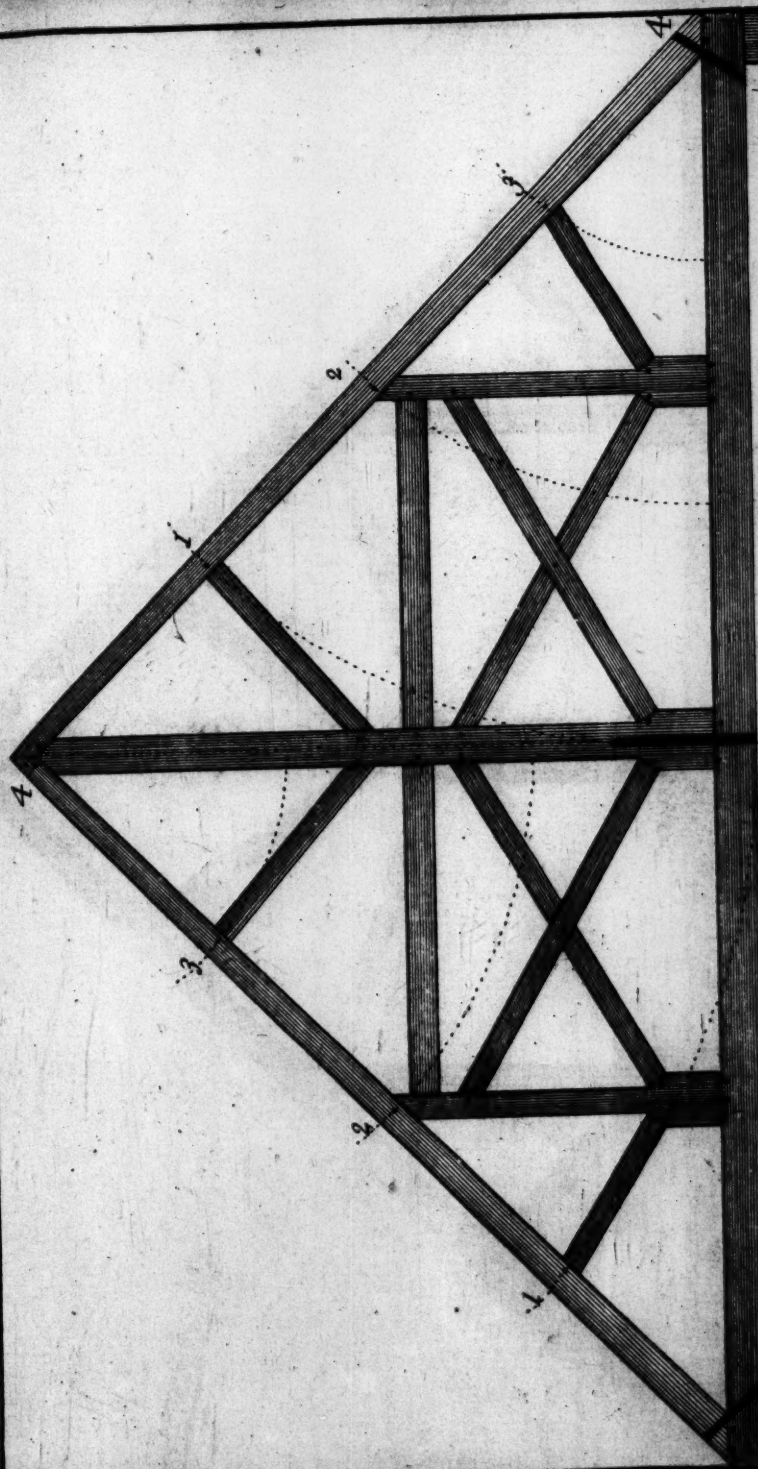
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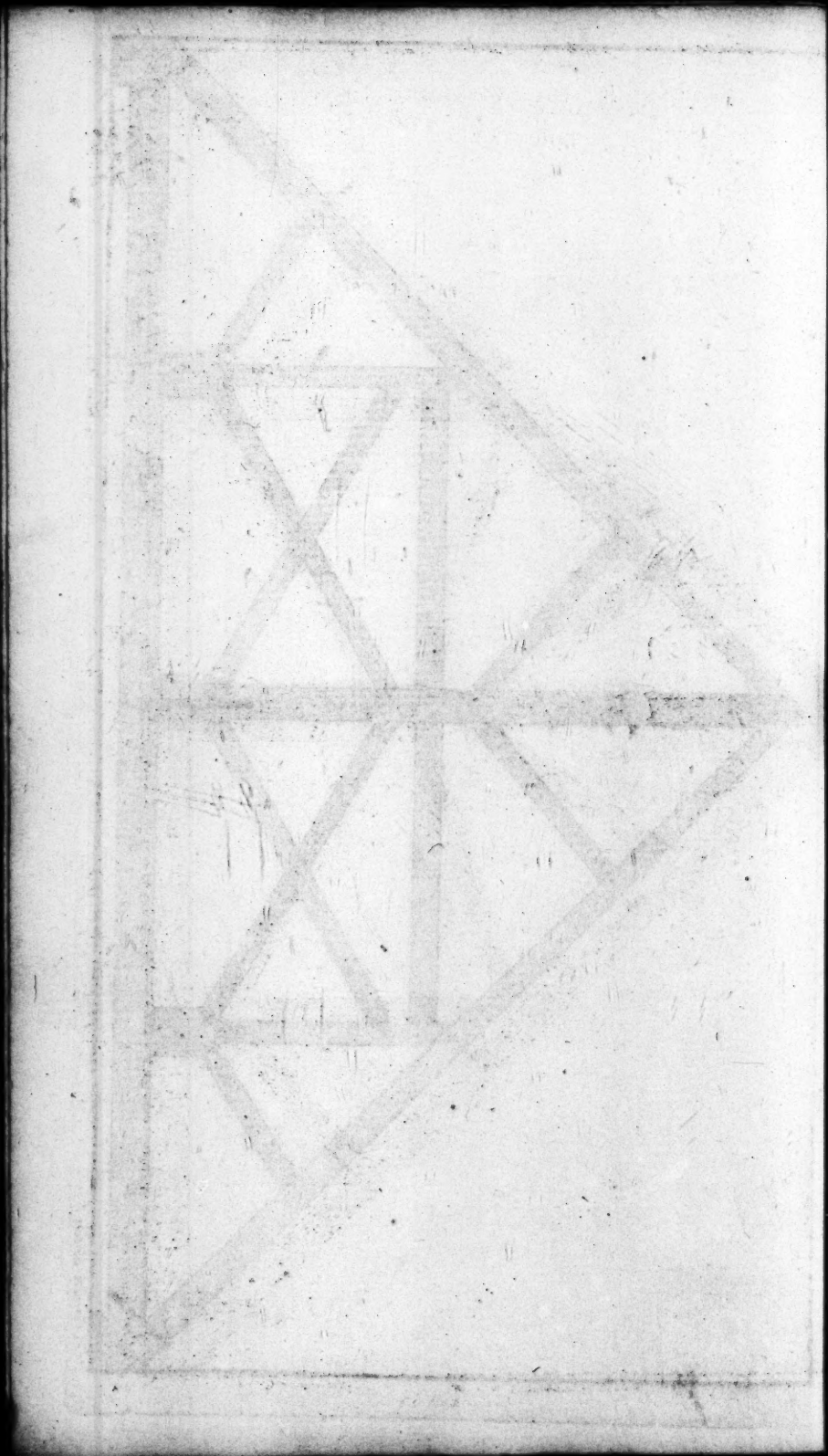
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B. Cole, Proprietor

J. Smith, Builder



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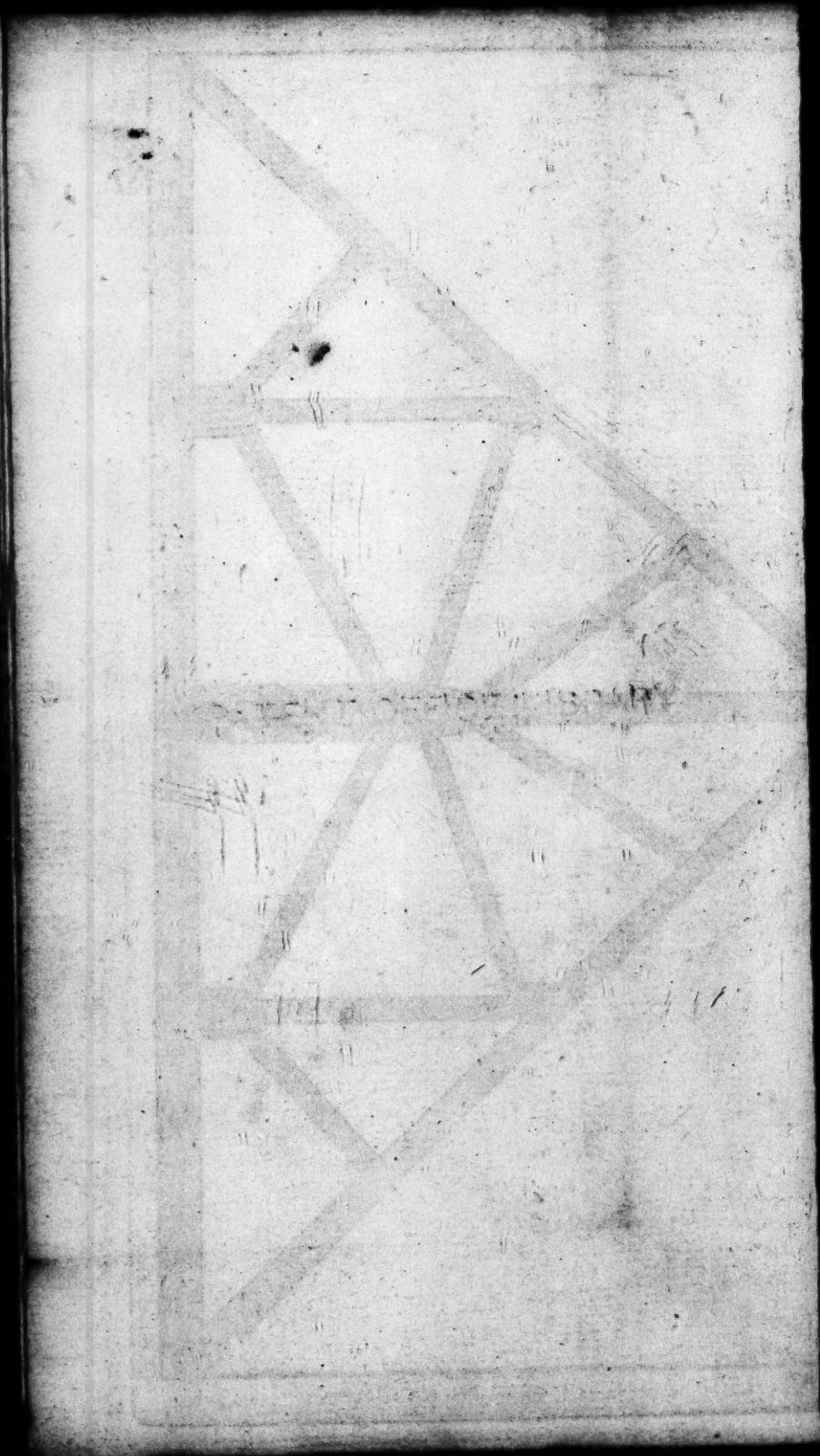
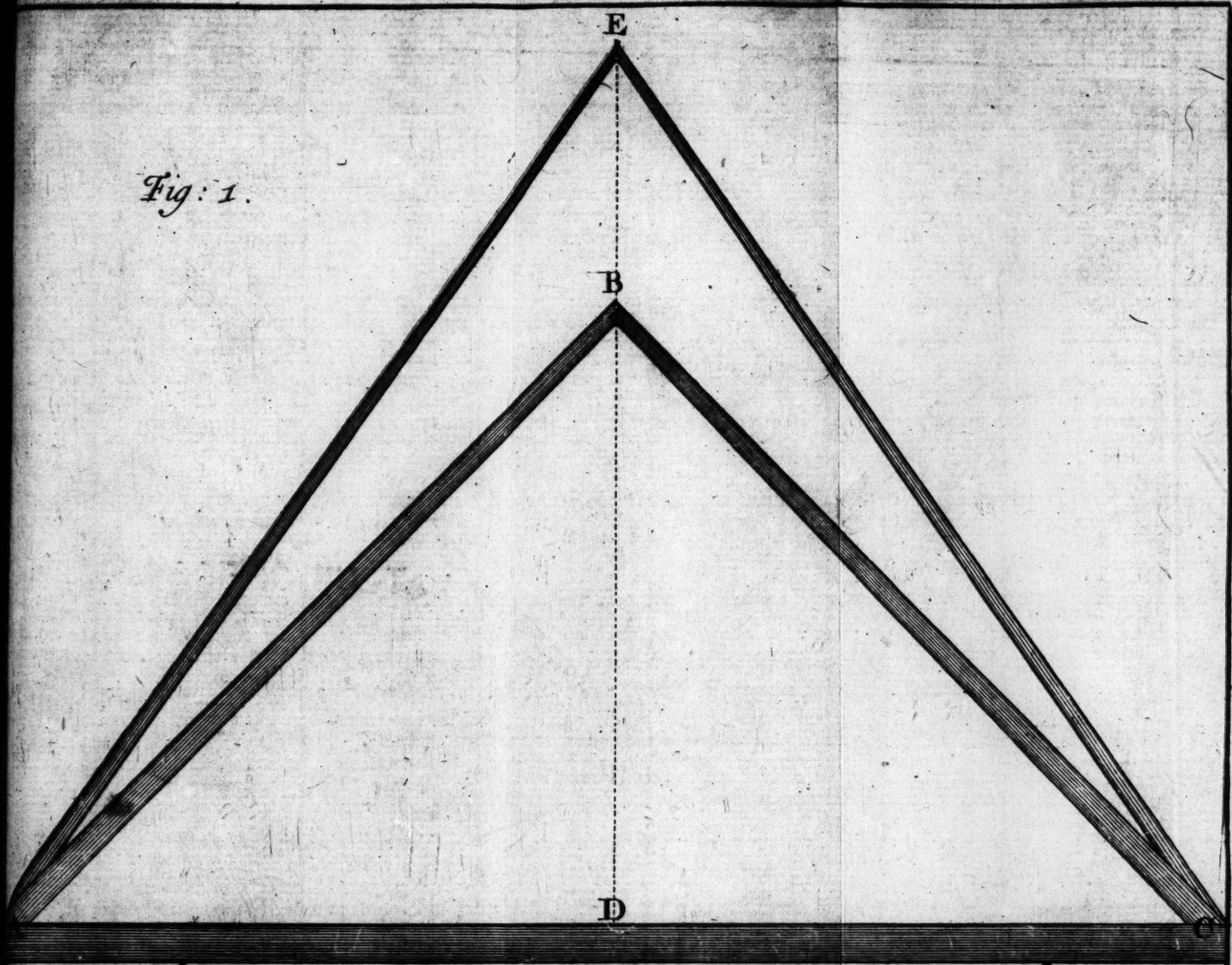
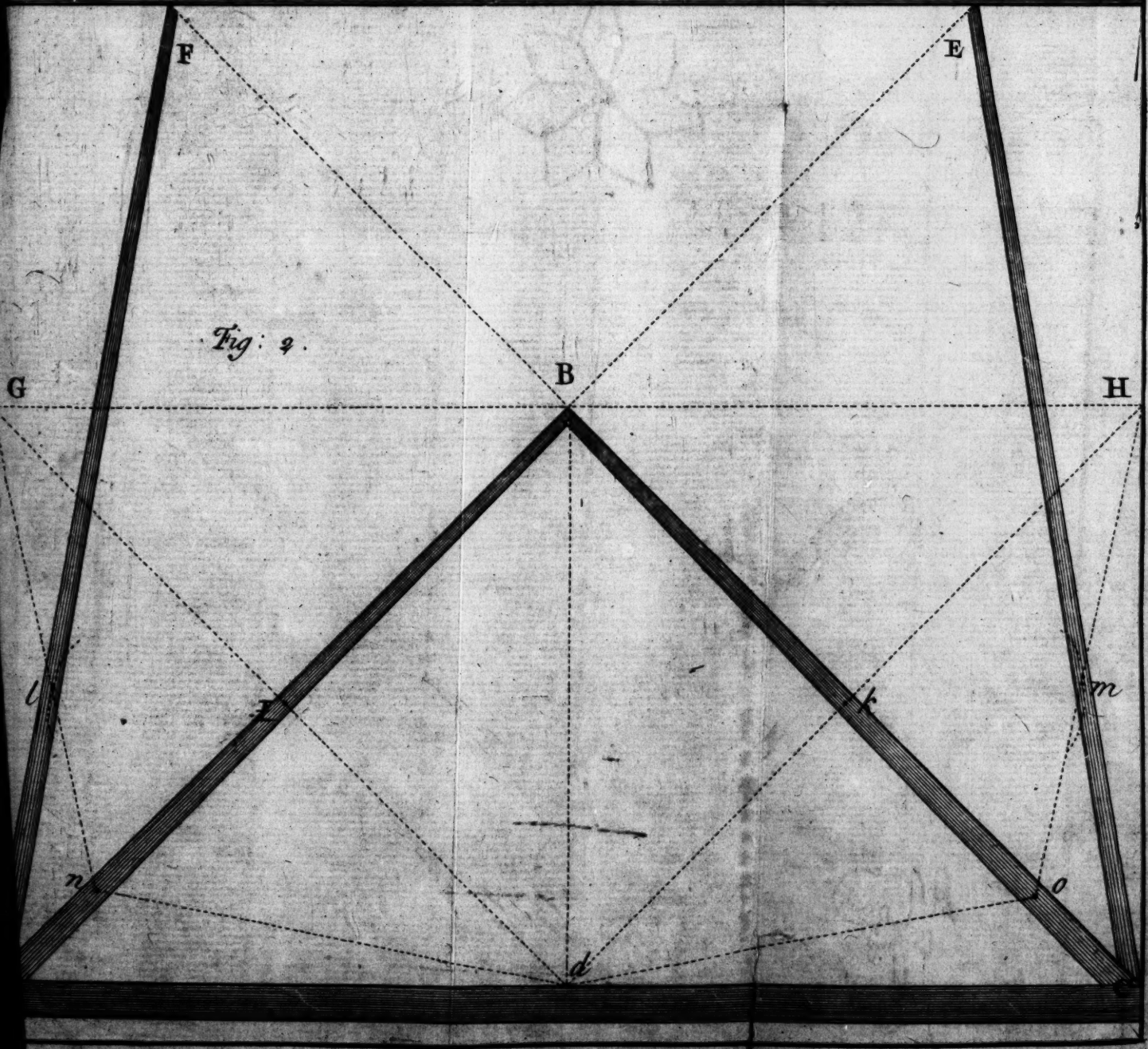


Fig: 1.



B. Cole Sculp.

Fig: 2.

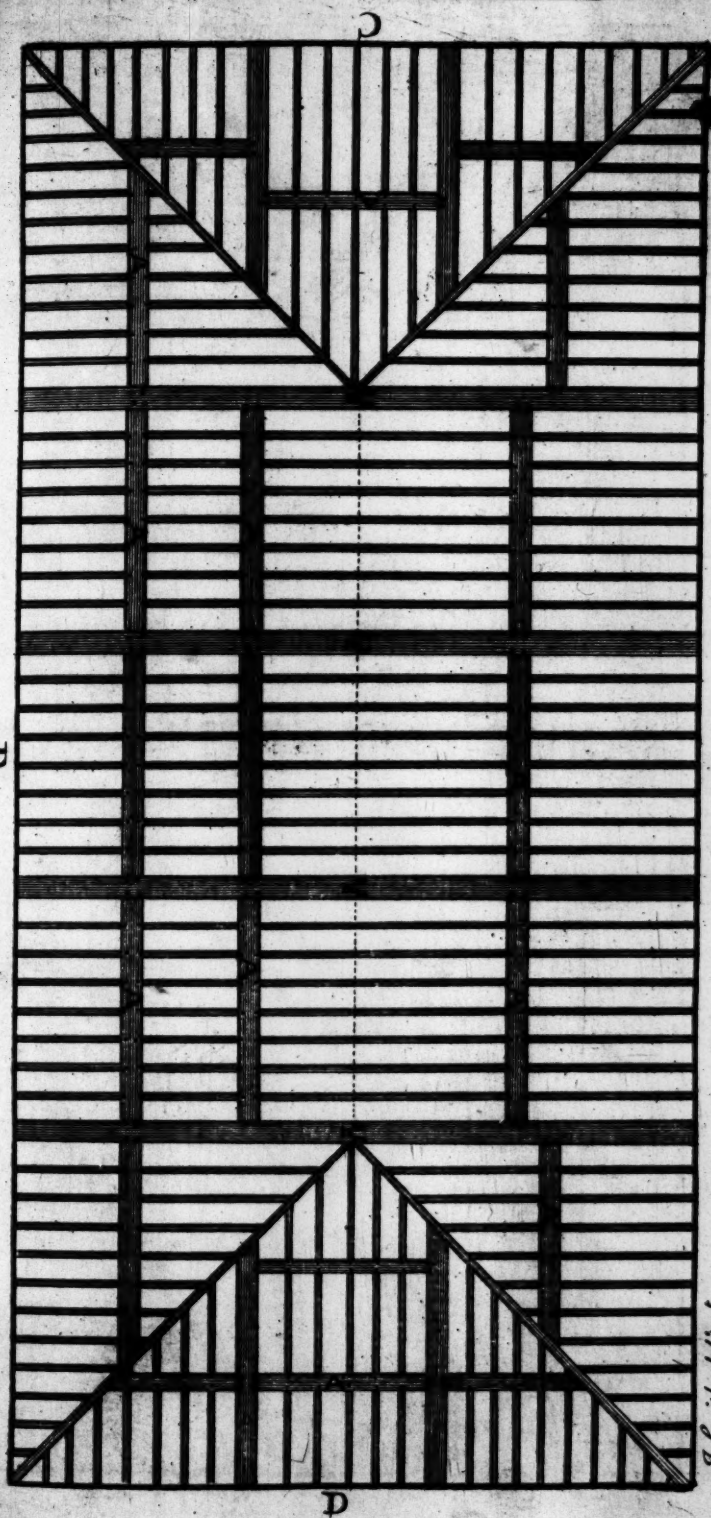


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B. Cole Sculp.

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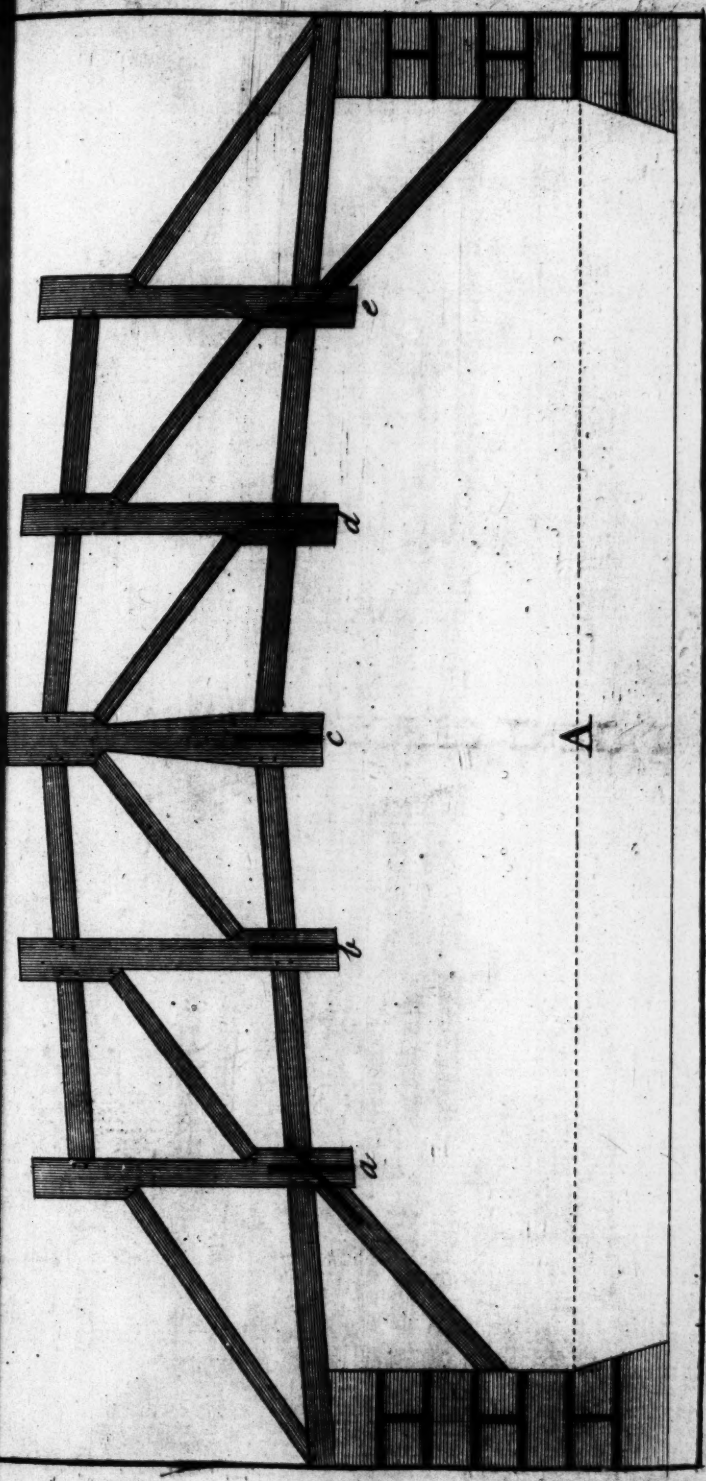
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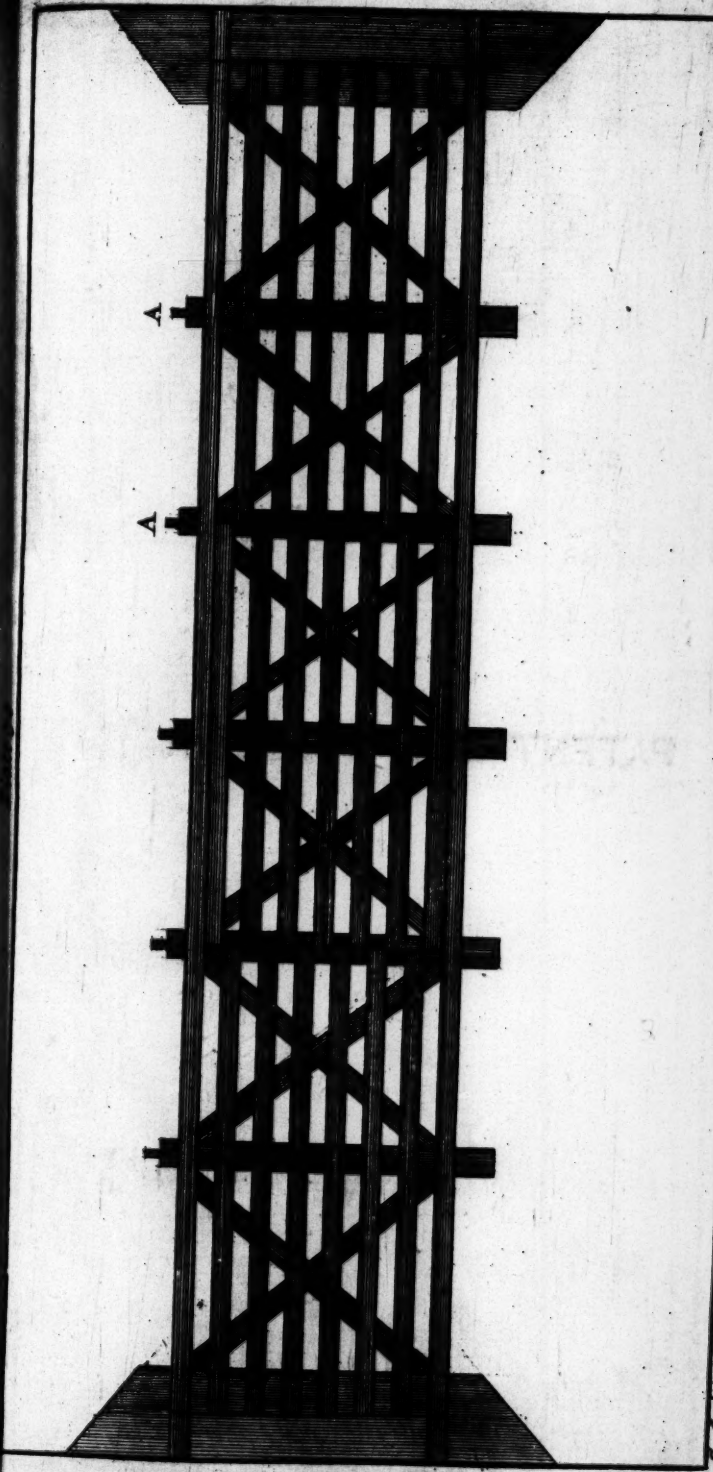
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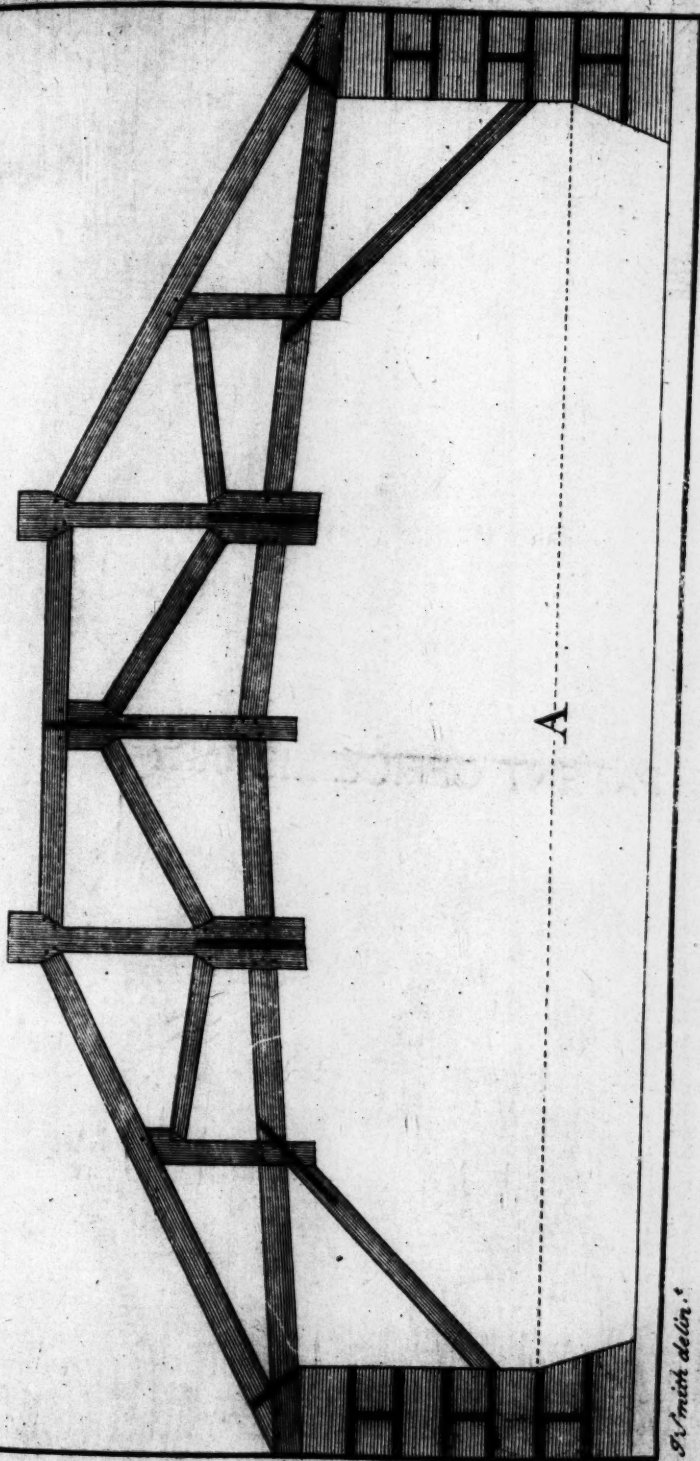
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B. Gate design

J. Smith design

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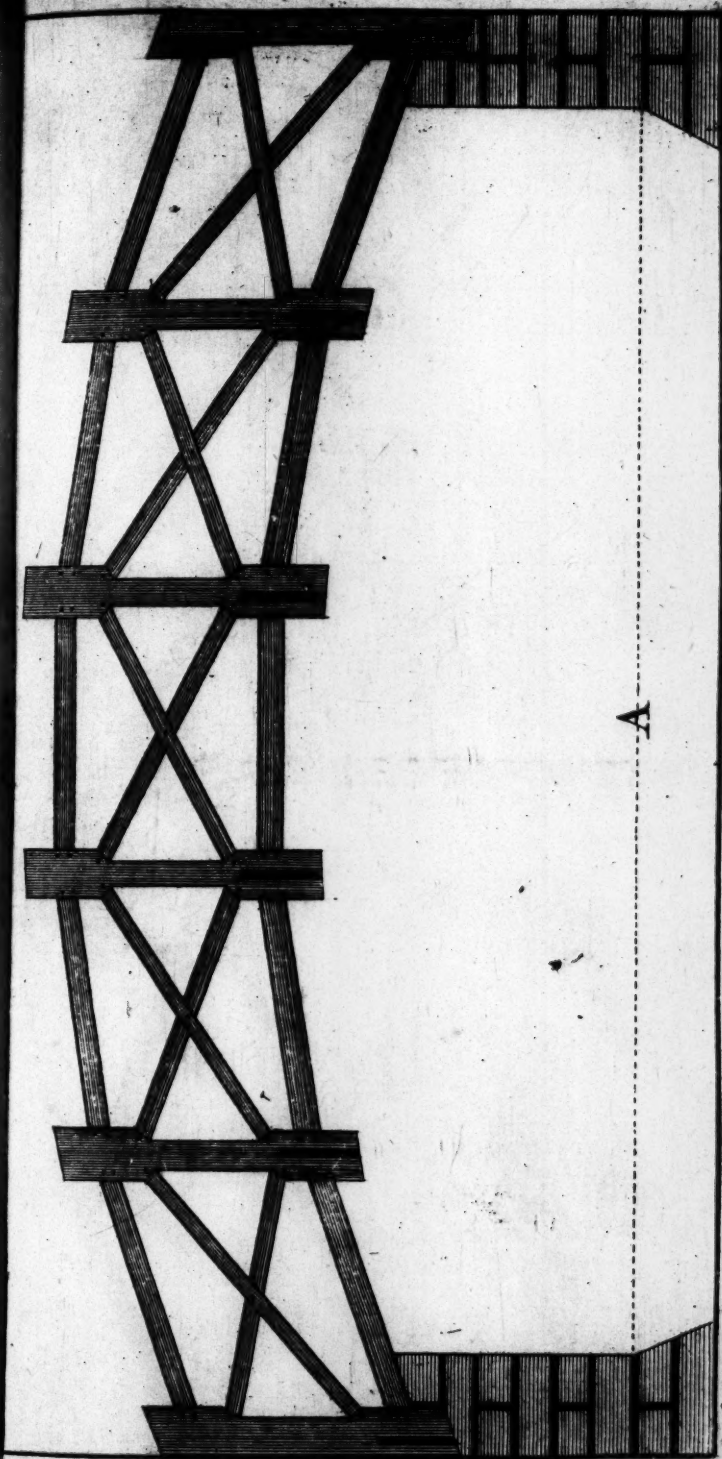
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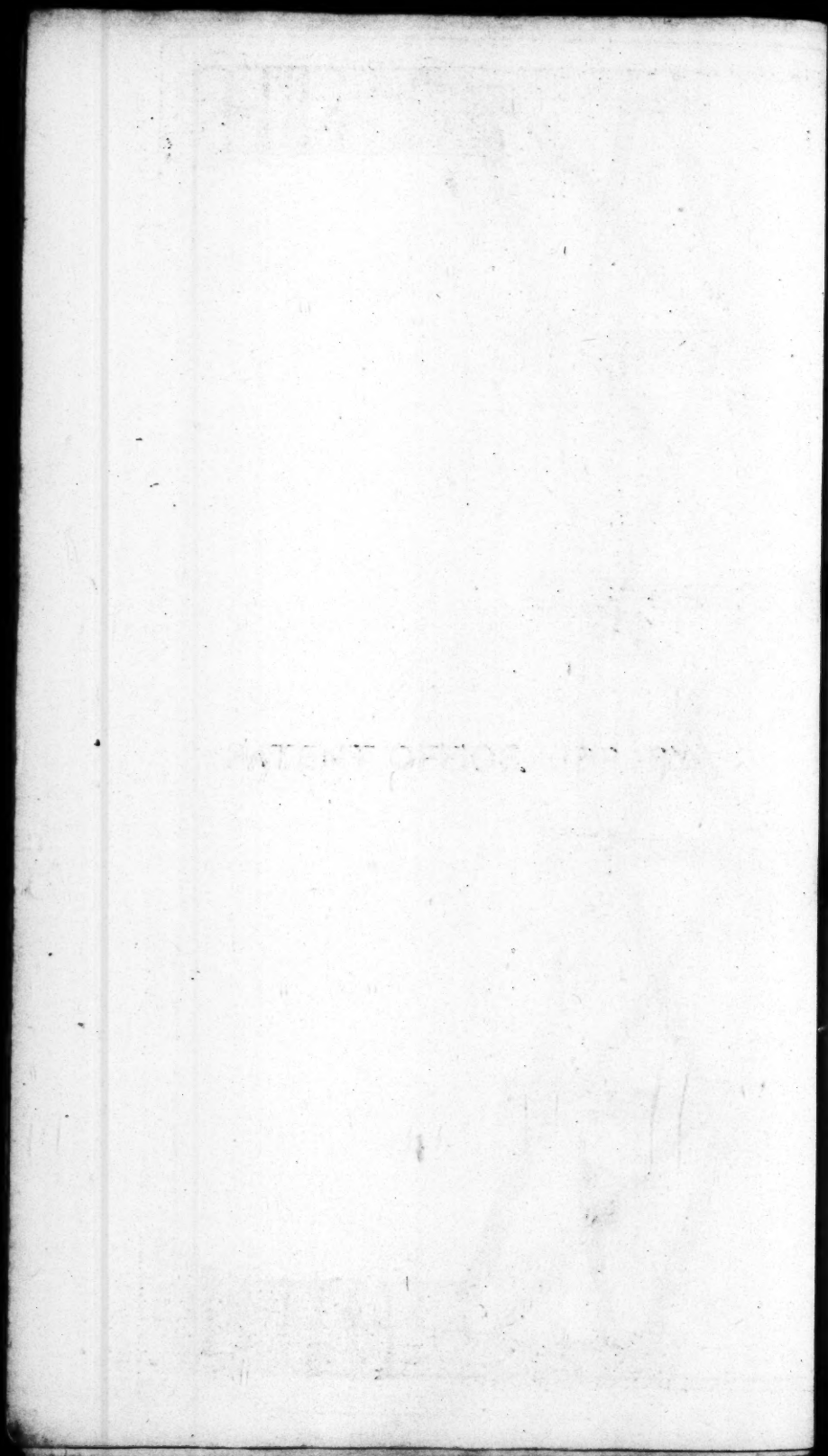
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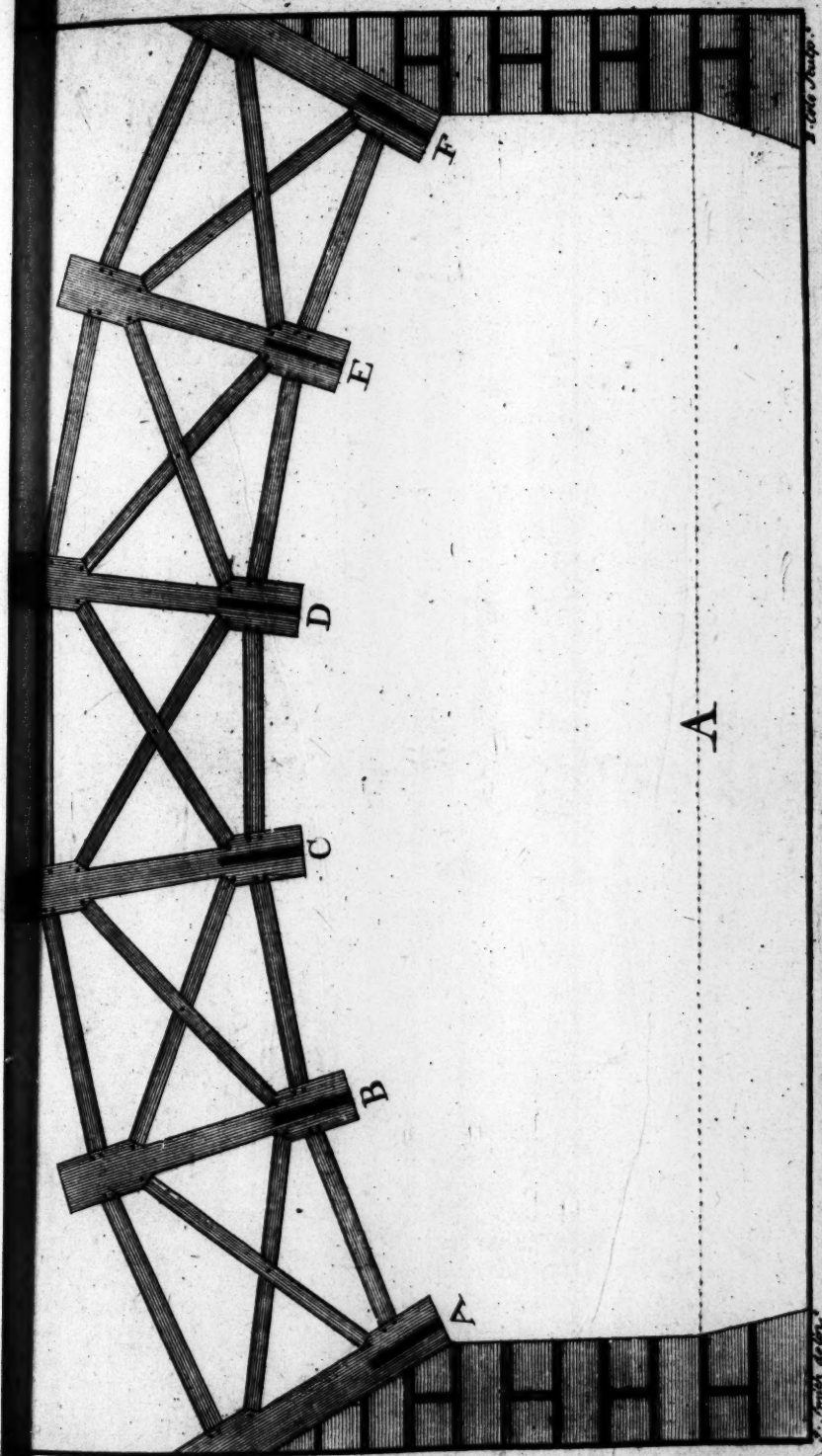
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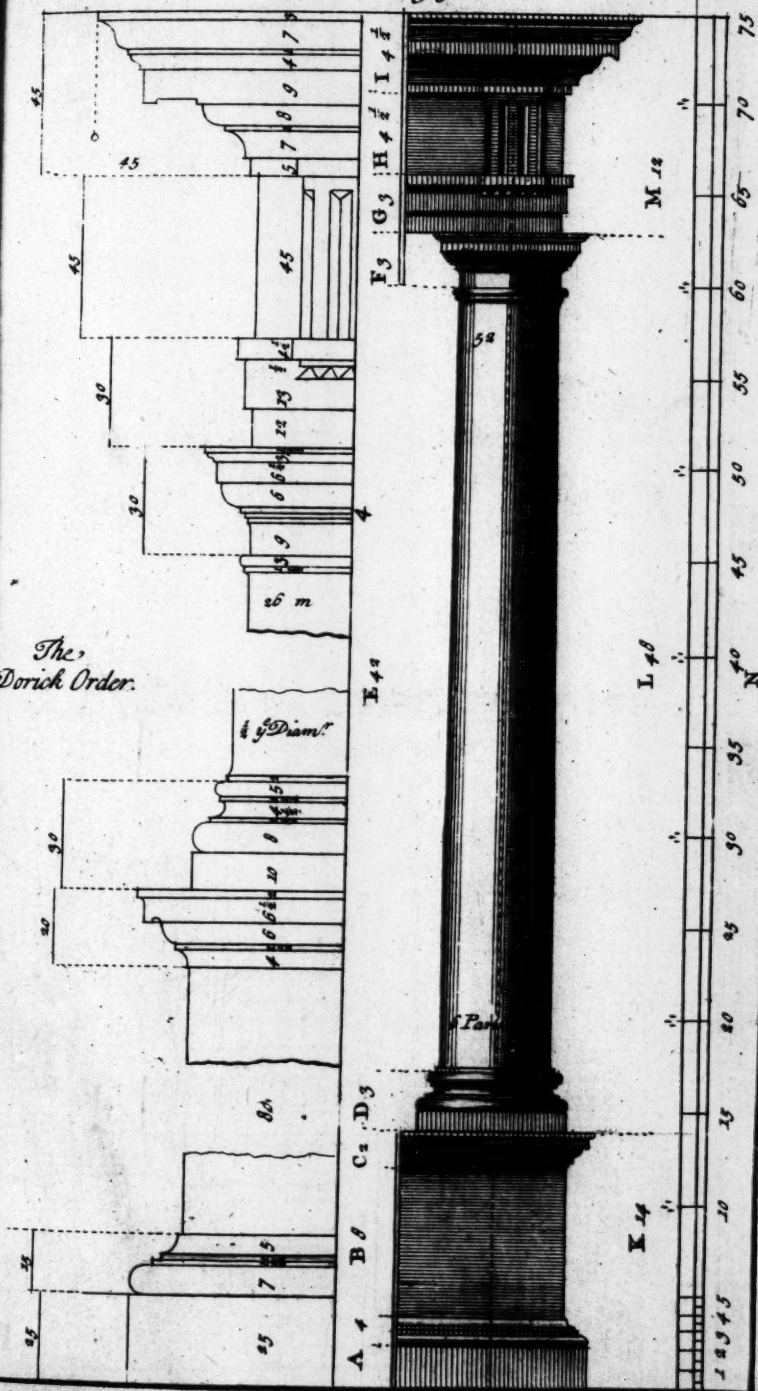


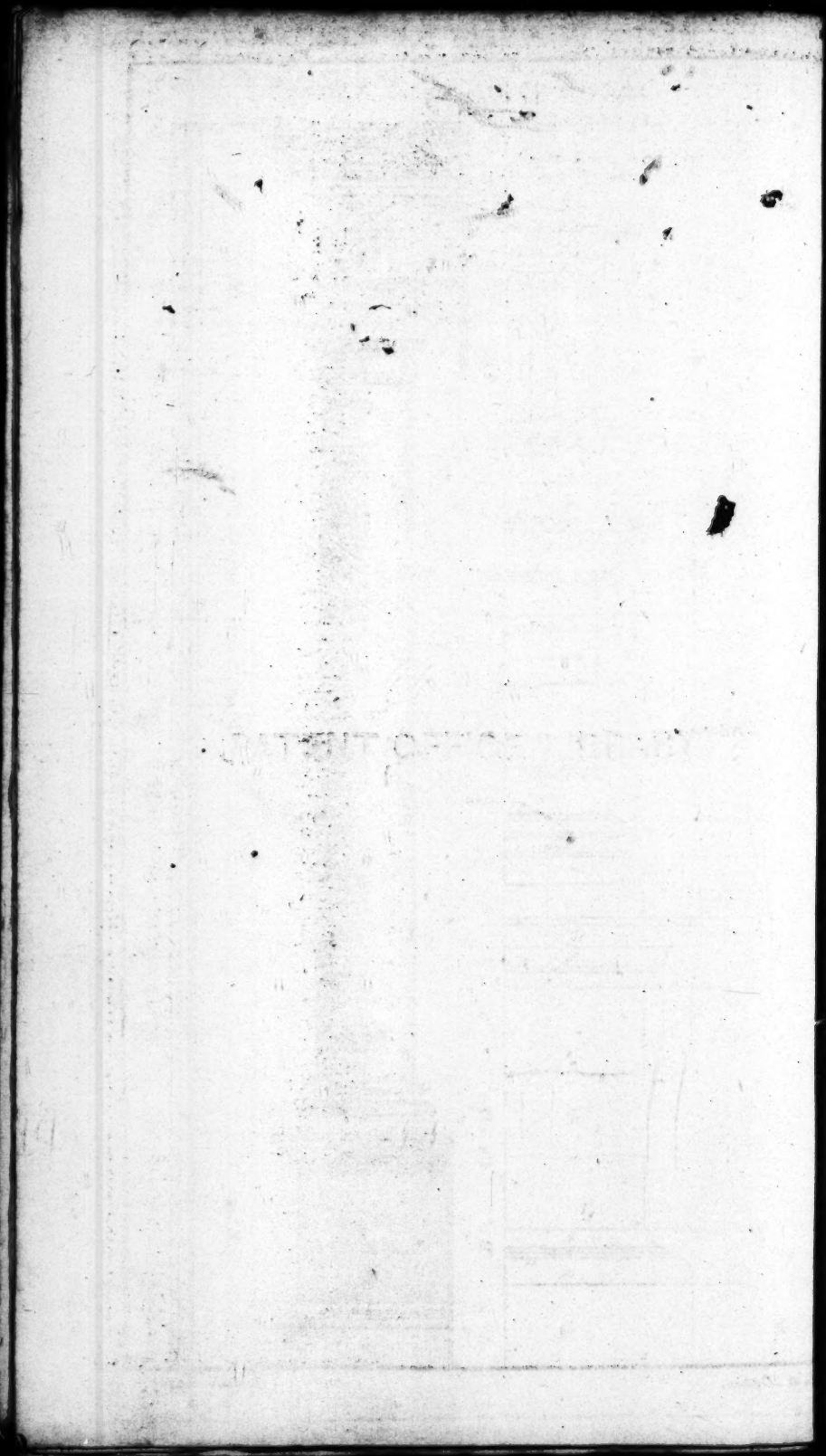
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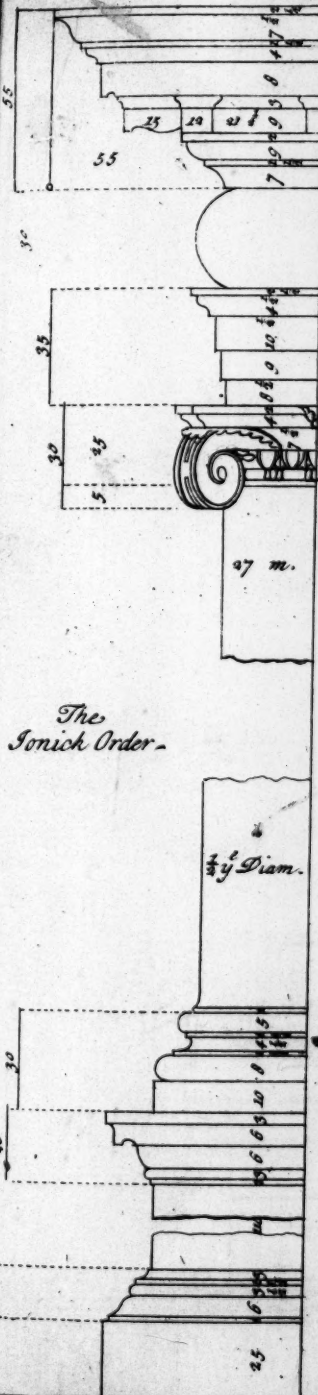
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The,
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$\frac{1}{4}$ Diam.

A 4 B 11 C 2 D 3 E 48 $\frac{1}{2}$ F 3 G 3 $\frac{1}{2}$ H 3 I 3 $\frac{1}{2}$

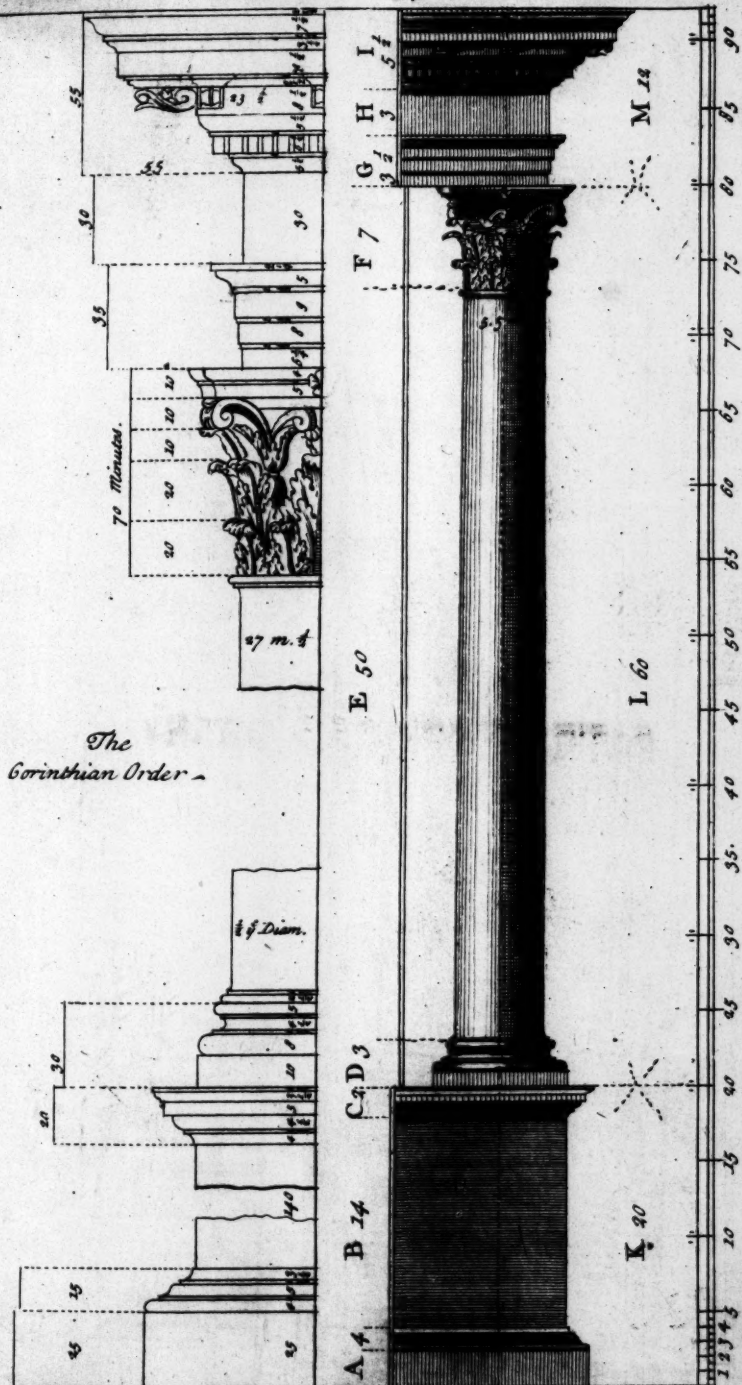
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Plate 37

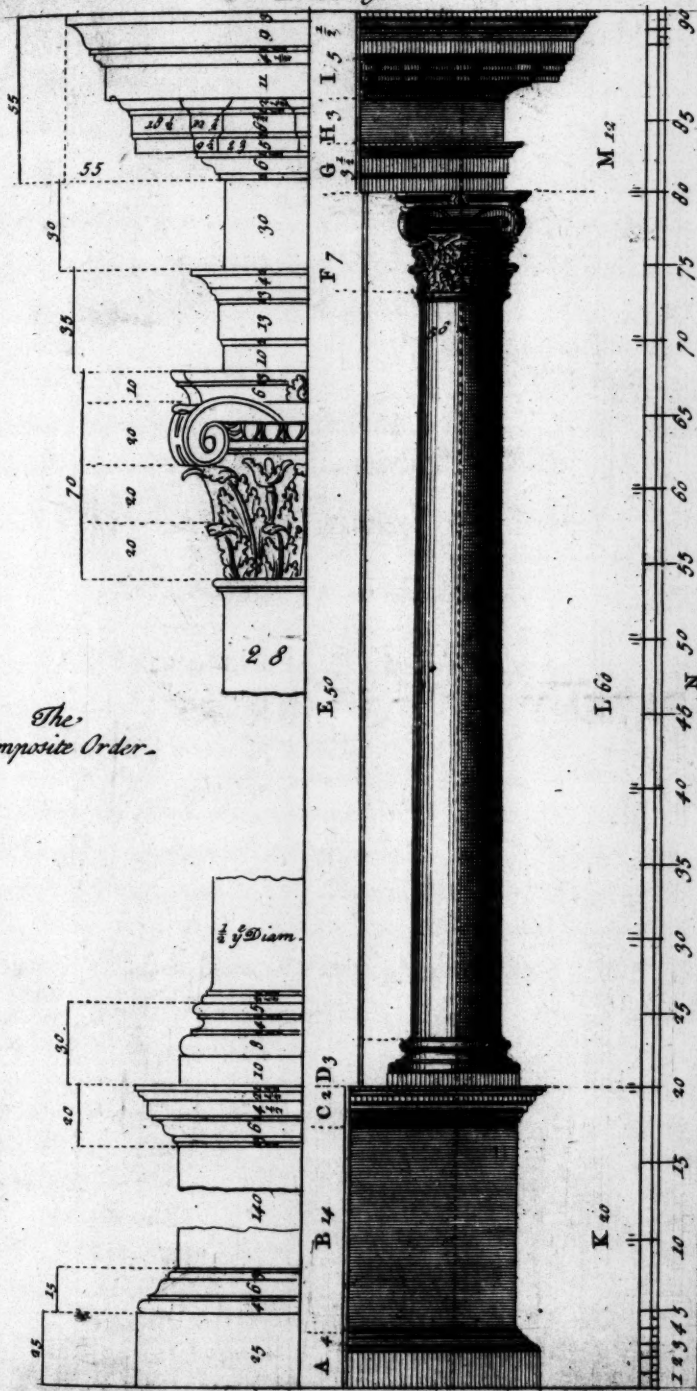


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The
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A Table of the 5 Orders of Architecture Regulated, Exemplify'd and Explain'd.

Let any given Height be divided into a certain Number of Equal Parts mark'd **N** for the Tuscan Order, 65 Parts, the Dorick 74 &c. as is shewn in this Table, these Parts I call Modules, 6 of which is the Diameter of your Column, subdivide each of these again into 10 Parts, these are Minutes, by which y^e small divisions are regulated, and the large divisions are Proportion'd by the Modules.

The 5 Orders.

		Tus can	Dor ic	Ion ic	Cor in	Com po
The whole Orders in Modules	The Height of y ^e Pedestal K in Modules. . .	11	14	17	20	20
	The Height of y ^e Column L w th y ^e Base & Capital. . .	42	48	54	60	60
	The Height of y ^e Entablature M in Modules. . .	12	12	12	12	12
	The whole Orders added together. . .	65	74	83	92	92
y ^e Pedestal w th Base & Plinth.	The Base & Plinth A of y ^e Pedestal in Modules. . .	4	4	4	4	4
	The Dado B of the Pedestal.	6	8	11	14	14
	The Cornice of the Pedestal C	1	2	2	2	2
y ^e Column w th its Base & Capital	The Base of the Column D in Modules. . .	3	3	3	3	3
	The Shaft of the Column E	36	42	48	50	50
	The Capital of the Column F	3	3	2½	7	7
y ^e Entable w th Archi trave, freeze & Cornice.	The Architrave of the Entablature G . . .	4	3	3½	3½	3½
	The Freeze H	3	4½	3	3	3
	The Cornice I	5	4½	5½	5½	5½
y ^e Pedestal w th each mem ber in Minutes	The Plinth of the Pedestal in Minutes. . .	40	25	25	25	25
	Torus.	-	7	-	4	4
	Fillet.	-	1½	1	1	1
	Cymaise.	-	-	6	5	6
	Astragale.	-	-	3½	1½	3
	Cincture.	-	1½	1½	1	1
	Cavetto.	-	5	3	2½	-
y ^e Dado	The Dado in Minutes.	60	80	110	140	140

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The 5 Orders

		Inf caric	Do nic	Lo nic	Co in	Com pol
Cornice of Pedestal its mem- bers in minutes.	The Gincture in Minutes.....	-	-	2	-	1 $\frac{1}{2}$
	Cavetto Astragale or Gymaise.....	-	4	3	4	3
	Ovolo or Gymaise.....	-	6	6	4 $\frac{1}{2}$	6
	Fillet.....	-	1 $\frac{1}{2}$	-	1 $\frac{1}{2}$	1
	Abacus.....	10	6 $\frac{1}{2}$	6	5	4 $\frac{1}{2}$
	Gymaise inverted or fillet.....	-	2	3	3 $\frac{1}{2}$	2 $\frac{1}{2}$
	Gincture.....	-	-	-	11	11
Base of Column Minutes	The Plinth of the Base of the Column in Minutes.....	15	10	10	10	10
	Lower Torus.....	13	8	8	8	8
	Fillet.....	-	1 $\frac{1}{4}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$
	Cavetto.....	-	4 $\frac{1}{2}$	4 $\frac{1}{2}$	4 $\frac{1}{2}$	4 $\frac{1}{2}$
	Gincture or fillet.....	2	1 $\frac{1}{4}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$
	Upper Torus.....	-	5	5	5	5
the Shaft with its members minutes	Astragale upon the upper Torus in Minutes.....	-	-	-	2 $\frac{1}{2}$	2 $\frac{1}{2}$
	Fillet or Gincture.....	-	2	2	1 $\frac{1}{2}$	1 $\frac{1}{2}$
	Fillet of the Necking.....	1 $\frac{1}{2}$	1 $\frac{1}{2}$	-	1 $\frac{1}{2}$	1 $\frac{1}{2}$
	Astragale or Necking.....	3	3	-	2	2
The Capital with its members minutes	The Necking or freeze of Capital.....	8 $\frac{1}{2}$	9	-	-	-
	Fillet or Annulets.....	1 $\frac{1}{2}$	4	1 $\frac{1}{2}$	-	-
	Astragale.....	1 $\frac{1}{2}$	-	6	-	-
	Ovolo or Echinus.....	10	6	6 $\frac{1}{2}$	-	-
	Plinth of the Capital.....	10	6 $\frac{1}{2}$	6 $\frac{1}{2}$	-	-
	Lysis or Gymaise.....	-	3	4	-	-
	First Height of Leaves.....	-	-	-	20	20
	Second Height of Leaves.....	-	-	-	20	20
	Third Fire of Leaves.....	-	-	-	10	-
	Volutes.....	-	-	25	10	20
	Cavetto of the Abacus.....	-	-	-	5	5
	Gymaise or fillet.....	-	-	2	1	1
	Echinus or fillet.....	-	-	1	4	4

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		Tus	Do	Lo	Co	Cor
		cauric	mic	in	pol	
G. The Architrave n ^o its members in Minutes	The first face of the Architrave in Minutes.....	33	12	8 $\frac{1}{2}$	6 $\frac{1}{2}$	10
	Beed or Cymaise.....	-	-	-	1 $\frac{1}{2}$	2
	Second face.....	-	13 $\frac{1}{2}$	9	8	13
	Beed or Fillet.....	7	4 $\frac{1}{2}$	-	1 $\frac{1}{2}$	1
	Third face or Cymaise.....	-	-	10 $\frac{1}{2}$	9	3
	Cavetto or Cymaise or Beed.....	-	-	4 $\frac{1}{2}$	1 $\frac{1}{2}$	-
	Fillet or Cavetto or Cymaise.....	-	-	2 $\frac{1}{2}$	5	4
	Cincture.....	-	-	-	2 $\frac{1}{2}$	2
H. y ^e Freeze	The Freeze in Minutes.....	30	45	30	30	30
I. y ^e Cornice with its members in Minutes.	The Fillet or Beed.....	-	5	-	-	2
	Cavetto or Cymaise.....	9 $\frac{1}{2}$	7	7	5 $\frac{1}{2}$	6
	Fillet.....	2 $\frac{1}{2}$	1	1 $\frac{1}{2}$	1	1 $\frac{1}{2}$
	Ovolo or Fillet or Dentells.....	10	8	9	6	-
	first face of Modillion or Ovolo &c.....	-	-	-	1	5
	Ovolo.....	-	-	-	5	-
	Beed.....	-	-	2	-	1
	Ovolo or Second face of Modillion.....	-	-	9	8 $\frac{1}{2}$	6 $\frac{1}{2}$
	Fillet or Cymaise to Modillion.....	-	-	3	3	1 $\frac{1}{2}$
	Echinus to Modillion.....	-	-	-	1 $\frac{1}{2}$	2 $\frac{1}{2}$
	Corona.....	12	9	8	8 $\frac{1}{2}$	11
	Fillet or invented Cymaise.....	2	4	4	3 $\frac{1}{2}$	4 $\frac{1}{2}$
	Fillet.....	-	1	1 $\frac{1}{2}$	1	1 $\frac{1}{2}$
	Cymaise.....	11	7	7 $\frac{1}{2}$	7 $\frac{1}{2}$	9
	Cincture.....	3 $\frac{1}{2}$	3	2 $\frac{1}{2}$	3	3
Example the 1 st	The use of the Table. Examples					
	To find y ^e Height of y ^e Pedestal n ^o its members in Modules look for K & you will find y ^e whole height 16 $\frac{1}{2}$	11	14	17	20	20
	If you would know y ^e height of y ^e Plinth of y ^e Base of y ^e Column in Minutes look for D	15	10	10	10	10
2 ^d	y ^e Base of y ^e Column & you find y ^e Plinth thus					
3 ^d	If you would know y ^e whole height of y ^e Architrave in Modules look for G a ^d M	4	3	3 $\frac{1}{2}$	3 $\frac{1}{2}$	3 $\frac{1}{2}$
	& you'll find y ^e Architrave in Modules					

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